

Expert Witnesses, Adversarial Bias, and the (Partial) Failure of the *Daubert* Revolution

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* Professor, George Mason University School of Law. The author thanks the George Mason University Law and Economics Center for providing funding for this Article. Joe Cecil, Ed Cheng, Carl Cranor, David Crump, George Gies, Sam Gross, David Kaye, John Langbein, Michael Risinger, and Chris Sanchirico provided helpful comments, as did participants in faculty workshops at Brooklyn Law School and the University of Michigan Law School.

I. INTRODUCTION

The American judiciary traditionally had a laissez-faire approach toward the admissibility of most categories of expert testimony.¹ This approach ended in federal courts when the U.S. Supreme Court adopted a reliability test for the admissibility of expert testimony in a series of three decisions beginning with *Daubert v. Merrell Dow Pharmaceuticals, Inc.*² An amendment to Federal Rule of Evidence 702 then codified a stringent interpretation of the “*Daubert* trilogy.”³ Many states also have adopted some version of the *Daubert* reliability test.⁴ Given that expert testimony is crucial to modern civil and criminal litigation, the emergence of the *Daubert*-702 reliability test for expert testimony is likely the most radical, sudden, and consequential change in the modern history of the law of evidence.

Despite the sweeping changes wrought by the *Daubert* trilogy, the Supreme Court never explained what implicit policy considerations motivated its decision to reverse generations of judicial practice. Instead, the Court relied on solely a wooden, literal interpretation of the then-extant version of Federal Rule of Evidence 702.⁵ In turn, the Federal Rules Advisory Committee, in amending Rule 702 to codify the trilogy, simply relied on the Supreme Court’s opinions. The Committee provided no independent justification for the new rule.⁶

The failure to explicate the logic behind *Daubert* and its progeny has left the reliability test vulnerable to persistent criticism.⁷ *Daubert* critics point out

1. See DAVID H. KAYE ET AL., *THE NEW WIGMORE: EXPERT EVIDENCE* § 1.1, at 2 (2004) (describing the pre-*Daubert* rules for the admissibility of expert testimony).

2. *Daubert v. Merrell Dow Pharms., Inc.*, 509 U.S. 579 (1993); see also *Kumho Tire Co., Ltd. v. Carmichael*, 526 U.S. 137 (1999); *Gen. Elec. Co. v. Joiner*, 522 U.S. 136 (1997).

3. FED. R. EVID. 702 & advisory committee’s note.

4. David E. Bernstein & Jeffrey D. Jackson, *The Daubert Trilogy in the States*, 44 *JURIMETRICS*J. 351, 357–61 (2004).

5. The Court asserted throughout the *Daubert* trilogy that its adoption of a reliability test for the admissibility of expert testimony necessarily resulted from Rule 702’s use of the word “knowledge” to describe expert testimony. See *Daubert*, 509 U.S. at 589–95; see also *Kumho Tire*, 526 U.S. at 147–49; *Joiner*, 522 U.S. at 142. Expert testimony based on unreliable principles or speculative inferences, the Court contended, does not constitute “knowledge.” See *Daubert*, 509 U.S. at 590; see also *Kumho Tire*, 526 U.S. at 148–49.

Oddly enough for a “plain meaning” interpretation of the rule, no other court interpreting the rule ever adopted this reading, which certainly raises suspicion that there were indeed practical concerns underlying the Court’s rulings.

6. FED. R. EVID. 702 advisory committee’s note. From the scuttlebutt this author has heard, the main goal of the Advisory Committee was to codify the trilogy in order to head off a movement in Congress to revise Rule 702 via legislation. The Committee, therefore, had neither the time nor inclination to provide a theoretical justification for the amended rule.

7. See, e.g., 22 CHARLES ALAN WRIGHT & KENNETH W. GRAHAM, JR., *FEDERAL PRACTICE AND PROCEDURE* § 5168.1 (Supp. 2007) (proclaiming that scientific evidence does not require strict judicial scrutiny); Richard D. Friedman, *Squeezing Daubert Out of the Picture*, 33 *SETON HALL L. REV.* 1047, 1053–56 (2003) (arguing that *Daubert* takes issues of sufficiency of evidence and improperly makes them into issues of admissibility); Dale A. Nance, *Reliability and the*

that no special reliability test applies to other categories of often unreliable testimony, such as eyewitness testimony.⁸ They argue that a reliability test is equally inappropriate for expert testimony.⁹

This Article contends that the implicit rationale for the modern special rules for expert testimony is that such testimony is uniquely vulnerable to “adversarial bias.”¹⁰ Adversarial bias refers to witness bias that arises because a party to an adversarial proceeding retains experts to advance its cause.¹¹

Admissibility of Experts, 34 SETON HALL L. REV. 191, 193 (2003) (advocating very minimal standards for expert testimony and expressing faith in the adversarial system); Jeffrey S. Parker, *Daubert's Debut: The Supreme Court, the Economics of Scientific Evidence, and the Adversarial System*, 4 SUP. CT. ECON. REV. 1, 32 (1994) (“The argument for an external standard [for the admissibility of expert testimony] was apparently based on the view that fact-finders are easily misled by expert opinion. But what has never been clear in this critique is why the adversary system is inadequate to cope with that danger.”).

8. On the unreliability of eyewitness testimony, see generally ELIZABETH F. LOFTUS, *EYEWITNESS TESTIMONY* (2d ed. 1996) (summarizing the literature discussing the reliability of eyewitness testimony).

9. See sources cited *supra* note 7; see also Mark P. Denbeaux & D. Michael Risinger, *Kumho Tire and Expert Reliability: How the Question You Ask Gives the Answer You Get*, 34 SETON HALL L. REV. 15, 24 (2003) (“The commonsense fear is that factfinders will defer to the unreliable expert and treat the unreliable expert’s testimony as reliable. One could respond that this danger exists in regard to all evidence.”).

10. By contrast, an older exclusionary rule for expert testimony, the *Frye* general acceptance test, had the limited rationale of mitigating “the misleading aura of certainty which [sic] often envelops a new scientific process.” *People v. Kelly*, 549 P.2d 1240, 1245 (Cal. 1976) (citing *Huntingdon v. Crowley*, 64 Cal. 2d. 647, 656 (1966)); see also *People v. Stoll*, 783 P.2d 698, 710 (Cal. 1989) (holding that the application of the general acceptance test “only applies to that limited class of expert testimony which is based, in whole or in part, on a technique, process or theory which is *new* to science, and even more so, the law”); *State v. Hasan*, 534 A.2d 877, 879 (Conn. 1987) (stating that applying a general acceptance test is appropriate when dealing with certain types of expert testimony that have the “potential to mislead lay jurors ‘awed by an “aura of mystic infallibility” surrounding “scientific techniques,” “experts” and the “fancy devices” employed” (quoting *United States v. Williams*, 583 F.2d 1194, 1199 (2d Cir. 1978))); *Donaldson v. Cent. Ill. Pub. Serv. Co.*, 767 N.E.2d 314, 329 (Ill. 2002) (contrasting machines or procedures that analyze physical data which might mistakenly convey that the results are objective and infallible, which are subject to *Frye*, with experts “extrapolat[ing]” from existing studies, who are clearly fallible and therefore do not require screening under *Frye*); *Kuhn v. Sandoz Pharms. Corp.*, 14 P.3d 1170, 1179–85 (Kan. 2000) (explaining that the rationale for a general acceptance test is fear that juries will be so overwhelmed by the scientific evidence that they will not use their critical faculties).

Scholars generally thought that juries were prone to overvaluing certain types of scientific testimony. See Edward J. Imwinkelried, *The Importance of Daubert in Frye Jurisdictions*, CRIM. L. BULL., Mar.–Apr. 2006, at 215 (“[T]he primary rationale for the *Frye* test is the policy concern that lay jurors will ascribe inflated importance to expert testimony.”). Therefore, courts typically applied the *Frye* test only to novel forensic techniques that they thought might overwhelm juries’ critical faculties, such as polygraph tests and voice spectrograph analysis. For example, the Supreme Court in California, the highest court of easily the most populous *Frye* jurisdiction, held that *Frye* applies only when “the evidence is produced by a machine” or by other seemingly objective means. *People v. McDonald*, 690 P.2d 709, 724 (Cal. 1984). The state supreme court reasoned that, “like many laypersons, jurors tend to ascribe an inordinately high degree of certainty to proof derived from an apparently ‘scientific’ mechanism, instrument, or

Adversarial bias has at least three sources: (1) conscious bias, (2) unconscious bias, and (3) selection bias.¹² The problem of conscious bias arises when “hired guns”¹³ adapt their opinions to the needs of the attorney

procedure.” *Id.* For *Frye* to apply in California, the proffered evidence must be the product of “[an] unproven technique or procedure [that] appears both in name and description to provide some definitive truth which the expert need only accurately recognize and relay to the jury,” such as machines or procedures that analyze physical data. *Stoll*, 783 P.2d at 710. However, *Daubert* and its progeny are gradually influencing jurisprudence in *Frye* jurisdictions, with the result that courts apply *Frye* more broadly to ensure reliable expert testimony in more contexts. See generally David E. Bernstein, *Frye, Frye, Again: The Past, Present, and Future of the General Acceptance Test*, 41 JURIMETRICS J. 385 (2001) (describing the history of the *Frye* rule and *Daubert*’s growing influence in *Frye* jurisdictions).

11. E. ALLAN LIND & TOM R. TYLER, *THE SOCIAL PSYCHOLOGY OF PROCEDURAL JUSTICE* 22–26, 113–17 (1988). As a prominent Australian judge puts it, “Apart from any question of dishonesty, the adversarial system is also calculated to bring forward unrepresentative opinions in cases where a range of opinions exists.” Justice H.D. Sperling, Supreme Court of N.S.W., Speech at the Supreme Court of New South Wales Annual Conference: Expert Evidence: The Problem of Bias and Other Things (Sep. 3–4, 1999), available at http://www.lawlink.nsw.gov.au/lawlink/supreme_court/ll_sc.nsf/pages/SCO_speech_sperling_030999; see also John H. Langbein, *The German Advantage in Civil Procedure*, 52 U. CHI. L. REV. 823, 836 (1985) (“[T]he systematic incentive in our procedure to distort expertise leads to a systematic distrust and devaluation of expertise. Short of forbidding the use of experts altogether, we probably could not have designed a procedure better suited to minimize the influence of expertise.”). But see Luke M. Froeb & Bruce H. Kobayashi, *Naive, Biased, yet Bayesian: Can Juries Interpret Selectively Produced Evidence?*, 12 J.L. ECON. & ORG. 257, 270 (1996) (developing a model suggesting that even when evidence is costly to produce, the competing incentives of adverse parties lead to a “full-information decision” at equilibrium).

12. Each of these biases was identified, though not given these names, by Sir George Jessel in *Abinger v. Ashton*, 17 L.R.Eq. 358 (Ch. 1873).

13. In theory, hired guns should not exist in the American legal system. Courts consistently reiterate that an expert witness’s professional duty is not to the party that pays her, but to the court and to the truth-finding process of the trial. See Mark S. Frankel, *Ethics and the Forensic Sciences: Professional Autonomy in the Criminal Justice System*, 34 J. FORENSIC SCI. 763, 764–65 (1989); Douglas R. Richmond, *Regulating Expert Testimony*, 62 MO. L. REV. 485, 486–87 (1997). Experts are therefore not agents of the party hiring them. *Kirk v. Raymark Indus.*, 61 F.3d 147, 164 (3d Cir. 1995). Unlike attorneys, they do not have ethical obligations to the party that pays them. *EEOC v. Locals 14 & 15, Int’l Union of Operating Eng’rs*, No. 72 Civ. 2498 (VLB), 1981 WL 163, at *4 (S.D.N.Y. Feb. 11, 1981). Thus, an expert who consults with one party, but is not retained as an expert for trial, may be retained by the opposing party. *Broward County v. Cento*, 611 So.2d 1339, 1340 (Fla. Dist. Ct. App. 1993); *Napolitano v. H.G. Grable Co.*, 455 N.Y.S.2d 79, 81 (N.Y. Sup. Ct. 1982).

As one court remarked, “despite the fact that one party retained and paid for the services of an expert witness, expert witnesses are supposed to testify impartially in the sphere of their expertise.” *Kirk*, 61 F.3d at 164; see also *Selvidge v. United States*, 160 F.R.D. 153, 156 (D. Kan. 1995) (“An expert witness should never become one party’s expert advocate. An expert witness should be an advocate of the truth with testimony to help the court and the jury reach the ultimate truth . . . which should be the basis of any verdict.”); *English Feedlot, Inc. v. Norden Labs., Inc.*, 833 F. Supp. 1498, 1501 (D. Colo. 1993) (“Experts are not advocates in the litigation but are sources of information and opinions.”). But cf. *Wilson v. City of Chicago*, 6 F.3d 1233, 1238 (7th Cir. 1993) (stating that the Federal Rules of Evidence do not require experts to be impartial); *Tagatz v. Marquette Univ.*, 861 F.2d 1040, 1042 (7th Cir. 1988) (finding a party could testify as his own expert witness).

who hires them. Ordinary lay witnesses also can have conscious bias,¹⁴ but that problem is not as acute for several reasons. First, lay witnesses, unlike experts, are not paid for their testimony, which eliminates the possibility of serving as a “witness for hire.” Second, lay witnesses are only permitted to present opinion testimony based on their own rational perceptions, limiting the scope of their testimony.¹⁵ Third, attorneys can shop from an almost unlimited pool of expert witnesses,¹⁶ while generally a very limited pool of potential ordinary fact witnesses exists in any given case.¹⁷ Finally, jurors may be particularly likely to assume that an expert witness, particularly a scientist, is an unbiased participant in the proceedings.¹⁸

Moreover, while it is often possible to discredit a lay witness by pointing out the source of her bias (such as a financial stake in the litigation or a relationship with a party), opposing counsel will inevitably find it extremely difficult to discredit a hired-gun expert for taking money for his testimony. After all, opposing counsel will have his own expert—who may be scrupulously honest and forthright—on his payroll.¹⁹ Therefore, opposing counsel will be unlikely to bring out the conscious bias of a hired gun effectively on cross-examination.

The second type of adversarial bias is unconscious bias. As Sir George Jessel pointed out in an English judicial opinion over a century ago, “Undoubtedly there is a natural bias to do something serviceable for those

Nevertheless, hired guns are widely recognized as a serious problem. As Judge Jack Weinstein stated, “An expert can be found to testify to the truth of almost any factual theory, no matter how frivolous . . .” Jack B. Weinstein, *Improving Expert Testimony*, 20 U. RICH. L. REV. 473, 482 (1986). Hired guns have, for example, been a major problem in asbestosis and silica litigation. See generally *In re Silica Prods. Liab. Litig.*, 398 F. Supp. 2d 563 (S.D. Tex. 2005) (detailing how experts skewed their testimony to benefit plaintiffs); David E. Bernstein, *Keeping Junk Science Out of Asbestos Litigation*, 31 PEPP. L. REV. 11 (2003) (discussing plaintiffs’ experts who find evidence of injury from asbestos exposure in almost every individual presented to them, even when the exposure was extremely limited).

14. See Chris William Sanchirico, *Evidence, Procedure, and the Upside of Cognitive Error*, 57 STAN. L. REV. 291, 317 (2004) (noting the potential effects of preparing witnesses).

15. FED. R. EVID. 701.

16. See BRUCE D. SALES & DANIEL W. SHUMAN, EXPERTS IN COURT: RECONCILING LAW, SCIENCE, AND PROFESSIONAL KNOWLEDGE 6 (2005) (“[M]any commentators have observed that lawyers often have a sufficient number of available expert witnesses to allow them to select one that will best represent a client’s partisan interests.”).

17. See Samuel R. Gross, *Expert Evidence*, 1991 WIS. L. REV. 1113, 1127 (“[T]he paradigmatic eyewitness is a stranger to the dispute who happened to be present when an accident happened, whose testimony is equally available to both sides, and who must give that testimony as a civic duty for a nominal fee and no more.”).

18. See 2 JOHN HENRY WIGMORE, EVIDENCE IN TRIALS AT COMMON LAW § 563, at 760 (James H. Chadbourn ed., 1979) (arguing that the problem with expert witness partisanship is not that these witnesses are more partisan than other witnesses, but that they are partisan regarding science, which most people believe to be impartial).

19. But see Ronald J. Allen & Joseph S. Miller, *The Common Law Theory of Experts: Deference or Education?*, 87 NW. U. L. REV. 1131, 1145–46 (1993) (contending that cross-examination will reveal an expert witness’s bias to the jury).

who employ you and adequately remunerate you.”²⁰ Unconscious bias exists across various categories of expertise,²¹ but it is an especially persistent and worrisome problem with regard to testimony by forensic scientists. Most forensic scientists work for government crime labs and are part of the prosecution team. Therefore, they naturally identify with the prosecutor’s goal of convicting a particular defendant.

A forensic expert’s unconscious bias can easily affect his conclusions,²² especially when these conclusions necessarily rely, as they often do, on subjective judgments.²³ Moreover, prosecutors are often responsible for evaluating forensic scientists’ performances. This can lead to a desire, conscious or not, to reach conclusions that assist the prosecution.

The third type of adversarial bias is selection bias. Selection bias means that the experts retained by a party will not represent a random sampling of expert opinions. Rather, they will represent the perspective the attorney wants to present at trial. Sir Jessel noted many years ago that experts are selected “according as their opinion is known to incline.”²⁴ As a result, the court does “not get fair professional opinion” from each party’s experts, but “an exceptional opinion” from each side.²⁵

Assume, for example, that the key issue in a particular case is whether a particular painting is a genuine Picasso. Assume also that of the fifty qualified Picasso experts in the United States, forty-two would conclude that it was real and eight that it was counterfeit.

Even if the attorney for the “it’s counterfeit” side chooses not to solicit a venal hired gun (or cannot find one), selection bias will allow this attorney to find several sincere, congenial experts from the sixteen percent who take that position.²⁶ The “it’s genuine” side will counter with several sincere

20. *Abinger v. Ashton*, 17 L.R.Eq. 358, 374 (Ch. 1873).

21. See Gross, *supra* note 17, at 1139 (noting that the process of preparing witnesses “pushes the expert to identify with the lawyers on her side and to become a partisan member of the litigation team”).

22. Roger Koppl, *How to Improve Forensic Science*, 20 EUR. J.L. & ECON. 255, 258 (2005) (“Information sharing between police investigators and forensic scientists creates the strong possibility of unconscious bias.”); Peter J. Neufield, *The (Near) Irrelevance of Daubert to Criminal Justice and Some Suggestions for Reform*, 95 AM. J. PUB. HEALTH S107, S111 (2005); D. Michael Risinger et al., *The Daubert/Kumho Implications of Observer Effects in Forensic Science: Hidden Problems of Expectation and Suggestion*, 90 CAL. L. REV. 1, 19 (2002) (noting that information sharing among police investigators and forensic scientists can lead to biased results).

23. While testifying forensic experts often portray their testimony as one hundred percent certain, a great deal of forensic testimony, including forensic anthropology, fingerprint evidence, and much more, ultimately relies on subjective judgment. See *infra* Part II.

24. *Abinger*, 17 L.R.Eq. at 374.

25. *Id.*

26. Cf. Gross, *supra* note 17, at 1134 (“The fact that a biologist from Harvard testifies that vitamin C is a cure for cancer does not mean that most biologists from Harvard believe that; it means that the lawyer who called her was able to find a biologist who both works at Harvard and agrees with that proposition.”).

experts of its own. The jury will receive a false sense that the issue is a very close one, when expert opinion actually overwhelmingly favors one side.²⁷

In some circumstances, the jury may not hear from *any* expert whose views represent mainstream expert opinion. For example, assume that the range of expert opinion regarding the appropriate amount of civil damages in a particular case is \$100,000 to \$800,000, with the median clustering around \$350,000. Assuming that search costs are not prohibitive, the parties are likely to present testimony from experts who endorse figures close to \$100,000 or \$800,000, but none who support a figure close to \$350,000.

If adversarial bias is the problem addressed by *Daubert* and Rule 702, the next question is whether the reliability test is a sound mechanism for reducing that bias. Amended Rule 702, codifying the *Daubert* trilogy, leaves the search for and selection of experts to the parties. It also retains the implicit assumption that expert witnesses primarily will be adversarial experts called and paid for by the parties. Thus, the Court and the Advisory Committee sought to retain the perceived advantages of the adversarial system.²⁸ Specifically, litigants have far more incentive to find a qualified, competent expert who can successfully challenge a preliminary conclusion

27. Of course, if resources allow, and the court permits it, the attorney for the “real” side could try to call as many of the forty-two experts who agree with its position. But this quickly becomes unwieldy, and in practice this strategy would not be feasible. An interesting question arises as to whether a party’s expert can simply survey other experts in the field and then rely on what he learned from those experts in his testimony. Most likely, courts would rule that Rule 703 permits reliance on hearsay, but only to allow an expert to form his own opinion, not to serve as a conduit for the hearsay opinions of others.

28. The adversarial system promotes judicial neutrality, reduces resource claims on the judiciary, and, perhaps most important, creates a greater incentive for each side to conduct a thorough search for evidence, especially when facts seem initially to point in one direction. See E. Allan Lind et al., *Discovery and Presentation of Evidence in Adversary and Nonadversary Proceedings*, 71 MICH. L. REV. 1129, 1143 (1973); see also Ellen E. Deason, *Court-Appointed Expert Witnesses: Scientific Positivism Meets Bias and Deference*, 77 OR. L. REV. 59, 62 (1998) (arguing that it is desirable to rely on the adversarial process to produce evidence because this prevents the judge and the jury from participating in evidence gathering and becoming partisans of one side or the other); Luke M. Froeb & Bruce H. Kobayashi, *Evidence Production in Adversarial vs. Inquisitorial Regimes*, 70 ECON. LETTERS 267, 271 (2001) (concluding that adversarial systems can be at least as effective as inquisitorial systems at producing relevant evidence); cf. Froeb & Kobayashi, *supra* note 11, at 270–71 (“Our results suggest that, in equilibrium, the decision-maker is able to overcome these shortcomings and reach a full-information decision when both parties choose to produce evidence.”). But see GORDON TULLOCK, TRIALS ON TRIAL 96 (1980) (concluding that inquisitorial proceedings will likely be more revealing and more accurate than adversarial proceedings because in the latter, “a great deal of the resources are put in by someone who is attempting to mislead”). For other skeptics of the adversarial system, see generally JEROME FRANK, COURTS ON TRIAL 82–87 (1949); MARVIN FRANKEL, PARTISAN JUSTICE (1980); Chief Justice Warren Burger, Address at the National Conference on the Causes of Popular Dissatisfaction with the Administration of Justice: Agenda for 2000 A.D.—A Need for Systemic Anticipation (Apr. 7–9, 1976), available at 70 F.R.D. 79, 83–96 (1976).

or the received (but incorrect) wisdom than will a judicial bureaucrat with no financial stake in the matter.²⁹

While retaining the adversarial system, Rule 702 tries to mitigate the consequences of adversarial bias by requiring district courts to exclude unreliable testimony. Expert testimony is admissible only when “(1) the testimony is based upon sufficient facts or data, (2) the testimony is the product of reliable principles and methods, and (3) the witness has applied the principles and methods reliably to the facts of the case.”³⁰

Rule 702 and the *Daubert* trilogy thus attempt to alleviate the problem of adversarial bias by allowing attorneys the opportunity to challenge the other side’s proffered expert testimony as unreliable.³¹ The question, however, is whether this solution is an adequate and appropriate response to the problem. This Article addresses this question in the context of three broad categories of expert evidence: forensic testimony in criminal cases, speculative causation testimony in toxic tort cases, and experience-based “connoisseur” testimony³² in all types of cases.

29. See Ronald J. Allen et al., *The German Advantage in Civil Procedure: A Plea for More Details and Fewer Generalities in Comparative Scholarship*, 82 NW. U. L. REV. 705, 717 (1988) (pointing out that inquisitorial systems rely on frequently slothful government bureaucrats to create evidence); Parker, *supra* note 7, at 27–28 (arguing that an inquisitorial system with regard to expert testimony would give judges “a stake in the litigation and therefore an incentive to influence the outcome” and that the appropriate way to bring social and private interest into sync is to follow “the tradition of party control and party presentation of evidence and argument, with the fact-finder playing essentially a passive role”).

30. FED. R. EVID. 702.

31. Thus, Justice Stevens’s critique of *Daubert* is mistaken or, at least, incomplete. He asserts that *Daubert*’s reliability requirement reflects “a fear that the average jury is not able to assess the weight of [expert evidence]” and a “distressing lack of confidence in the intelligence of the average American.” *United States v. Scheffer*, 523 U.S. 303, 337 (1998) (Stevens, J., dissenting). If jury competence, as such, was the underlying rationale for *Daubert*, the Court could have retained the *Frye* rule, preserving the distinction between “scientific” evidence subject to some sort of reliability test and routine expert testimony exempt from such a test.

Interestingly, just six months after the Court decided *Daubert*, Federal Rule of Civil Procedure 26(a)(2) was amended in another effort to limit adversarial bias. The amended Rule provides that parties planning to use experts must prepare a report containing:

a complete statement of all opinions to be expressed and the basis and reasons therefor; the data or other information considered by the witness in forming the opinions; any exhibits to be used as a summary of or support for the opinions; the qualifications of the witness, including a list of all publications authored by the witness within the preceding ten years; the compensation to be paid for the study and testimony; and a listing of any other cases in which the witness has testified as an expert at trial or by deposition within the preceding four years.

FED. R. CIV. P. 26(a)(2)(B).

32. David Kaye admonishes the author that although “connoisseur” is derived from *connoistre* or *connaître*, ordinarily it denotes a person with extensive knowledge about fine arts or an expert judge in matters of taste. Using the word “connoisseur” to refer to a police officer with experience dealing with criminal gangs and knowledge of their organization strays from the word’s ordinary meaning. The author pleads guilty to using the word idiosyncratically.

In Part II, this Article concludes that the reliability test is not, by itself, an adequate solution to the problem of adversarial bias in forensic science; rather, a major overhaul of the forensic science system is needed. As for speculative causation and connoisseur testimony, discussed in Parts III and IV of this Article, respectively, Rule 702's reliability test is too restrictive. The rule requires the exclusion of virtually all such testimony, even when the testimony potentially could be useful to the trier of fact, because, as discussed below, such testimony never has objective indicia of reliability when provided by adversarial experts. Courts currently face two choices: they can faithfully apply Rule 702's dictates and entirely exclude potentially helpful categories of evidence or ignore or evade the strictures of Rule 702 and admit testimony not shown to be reliable. A better alternative would be for courts to appoint nonpartisan experts to advise them on the reliability of proffered testimony or perhaps even exclude adversarial experts and replace them with court-appointed experts. As discussed below, assuming appointed experts meet preliminary tests of competency, the nonpartisan stance of such experts will provide the necessary objective signal of reliability required to admit the testimony under Rule 702.

II. FORENSIC SCIENCE

The vast majority of forensic science testimony is used by the prosecution in criminal cases. With rare exceptions, neither prosecutors nor forensic experts want to convict innocent people. Therefore, conscious bias should not be a significant problem among prosecution forensic experts. Moreover, selection bias with regard to the choice of forensic experts is a relatively minor problem. While a prosecutor occasionally shops for an outside hired gun, most testifying forensic experts are government employees working for the same jurisdiction as the prosecutor. Nevertheless, as various scandals suggest and various studies conclude, courts cannot rely on forensic scientists to present reliable and unbiased testimony.³³

33. See generally Erica Beecher-Monas, *Blinded by Science: How Judges Avoid the Science in Scientific Evidence*, 71 TEMP. L. REV. 55 (1998); Craig M. Cooley, *Reforming the Forensic Science Community to Avert the Ultimate Injustice*, 15 STAN. L. & POL'Y REV. 381 (2004); Paul C. Giannelli, *The Abuse of Scientific Evidence in Criminal Cases: The Need for Independent Crime Laboratories*, 4 VA. J. SOC. POL'Y & L. 439 (1997) [hereinafter Giannelli, *Abuse of Scientific Evidence*]; Paul C. Giannelli, *Fabricated Reports*, 16 CRIM. JUST. 49 (2002); Paul C. Giannelli, "Junk Science": *The Criminal Cases*, 84 J. CRIM. L. & CRIMINOLOGY 105 (1993) [hereinafter Giannelli, *Junk Science*]; Randolph N. Jonakait, *Forensic Science: The Need for Regulation*, 4 HARV. J.L. & TECH. 109 (1991); Jennifer L. Mnookin, *Scripting Expertise: The History of Handwriting Identification Evidence and the Judicial Construction of Reliability*, 87 VA. L. REV. 1723, 1725 (2001); Andre A. Moenssens, *Novel Scientific Evidence in Criminal Cases: Some Words of Caution*, 84 J. CRIM. L. & CRIMINOLOGY 1 (1993); Barry C. Scheck, *New Hope for Forensic Science Quality*, CHAMPION, Mar. 2005, at 4. Similar problems have arisen in other common law countries. See David E. Bernstein, *Junk Science in the United States and the Commonwealth*, 21 YALE J. INT'L L. 123 (1996) (discussing, *inter alia*, forensic science scandals in other common law countries).

One problem is that many frequently used forensic techniques have not been proven reliable and have high rates of error when tested.³⁴ But, even when forensic experts use reliable techniques, testimony based on these techniques is often flawed. A recent article neatly summarizes several reasons forensic testimony is so problematic:³⁵

- Each jurisdiction typically has just one forensic laboratory; the absence of competition reduces the incentive to perform well.³⁶
- Forensic labs are usually attached to police departments and therefore depend on the police department for their budgets, which naturally leads to a desire to please the police, even at the cost of honesty and thoroughness.³⁷
- Quality control is weak at most forensic labs.³⁸
- Forensic scientists often know what result they are “supposed” to reach, which can lead to an unconscious bias in interpretations of test results, or even conscious fraud.³⁹
- The scientist who performs a particular test typically also interprets the results of the test, reducing the odds that anomalies will be discovered.⁴⁰

In short, even when forensic scientists are using reliable techniques, forensic science testimony is subject to significant unconscious adversarial bias. Moreover, the structure of the forensic science system means that such bias, or even outright fraud, is likely to go undiscovered.

Rule 702 and the *Daubert* trilogy’s solution to these problems is to provide a reliability test for all expert testimony, including forensic testimony. Enforced strictly and universally, this test would dramatically improve the quality of expert forensic testimony. In practice, however, defense attorneys are rarely successful at challenging the admissibility of prosecution forensic science. The problem is not simply that courts are too inclined to admit prosecution testimony (though perhaps they are).⁴¹

34. See generally Giannelli, *Junk Science*, *supra* note 33 (discussing unreliable evidence).

35. Koppl, *supra* note 22, at 257.

36. *Id.*

37. *Id.*; see also *id.* at 260–62; Giannelli, *Abuse of Scientific Evidence*, *supra* note 33, at 475.

38. Koppl, *supra* note 22, at 266–71.

39. *Id.* at 257; see also Giannelli, *Abuse of Scientific Evidence*, *supra* note 33, at 447; Neufield, *supra* note 22, at S110; Risinger et al., *supra* note 22, at 27–42.

40. Koppl, *supra* note 22, at 257, 262–64.

41. See, e.g., Margaret A. Berger, *Expert Testimony in Criminal Proceedings: Questions Daubert Does Not Answer*, 33 SETON HALL L. REV. 1125, 1140 (2003) (noting that courts tend to be stricter about the admissibility of expert testimony in civil cases than they are in criminal cases); D. Michael Risinger, *Navigating Expert Reliability: Are Criminal Standards of Certainty Being Left on the Dock?*, 64 ALB. L. REV. 99, 103–12 (2000) (providing empirical evidence that judges are more likely to admit prosecution expert testimony than other types of expert testimony).

Rather, defense attorneys often fail to challenge the admissibility of questionable testimony to begin with.

The effectiveness of Rule 702, meanwhile, depends on enforcement by competent attorneys willing and able to expend sufficient time and resources to challenge unreliable testimony. Unfortunately, defense attorneys rarely meet this ideal. Public defenders, for example, are frequently “inexperienced, overworked, and underpaid.”⁴² These attorneys often do not have the resources to investigate, much less challenge, forensic testimony proffered by the prosecution. Court-appointed defense attorneys also operate under severe resource constraints if they seek to challenge the prosecution’s expert testimony.⁴³

To make matters even more unbalanced, most forensic scientists are affiliated with crime labs controlled by the prosecution and are prohibited from assisting defendants.⁴⁴ As Peter Neufield concludes, “If no one challenges the speculative science or scientist, there is nothing for a gatekeeper to tend to. Thus, the principal failing of *Daubert* is its misplaced reliance on a robust adversarial system to expose bad science.”⁴⁵

Given the inadequacies of *Daubert* in the forensic science context, scholars have proposed that instead of, or in addition to, Rule 702, the following reforms should be implemented:⁴⁶

42. Samuel R. Gross & Jennifer L. Mnookin, *Expert Information and Expert Evidence: A Preliminary Taxonomy*, 34 SETON HALL L. REV. 141, 157 (2003); see also Koppl, *supra* note 22, at 265–66. Koppl notes:

High-quality counsel is not a free good. Without constraints on their time or energy, skilled and intelligent lawyers could learn enough about the limits of forensics to persuade judges and juries in those cases in which the forensic evidence presented by the prosecution was deficient; no innocents would be jailed because of forensic error. Good lawyering is a scarce good, however.

Id.

43. For example, a publicly appointed defense attorney in federal court may seek advice from an expert, but only if total expenditures on experts consulted amount to less than one thousand dollars. Most states are even less generous. See Paul C. Giannelli, *Ake v. Oklahoma: The Right to Expert Assistance in a Post-Daubert, Post-DNA World*, 89 CORNELL L. REV. 1305, 1338 (2004). Experts, meanwhile, typically charge hundreds of dollars an hour.

44. Giannelli, *supra* note 43, at 1378; Henry Lee, *Forensic Science and the Law*, 25 CONN. L. REV. 1117, 1124 (1993) (“Most forensic laboratories in the United States are . . . housed within police or federal law enforcement agencies. Laboratories that operate under the supervision of police departments or prosecutors’ office are generally not available to the defense.”); see also Koppl, *supra* note 22, at 257.

45. Neufield, *supra* note 22, at S110.

46. Additional useful suggestions are likely to come from a forthcoming report by the American Judicature Society Commission on Forensic Science and Public Policy chaired by former Attorney General Janet Reno. See American Judicature Society, AJS Commission on Forensic Science and Public Policy, http://www.ajs.org/wc/wc_commission.asp (last visited Oct. 1, 2007).

- Independent audits should be conducted to investigate instances of misconduct or gross negligence.⁴⁷
- A national system of accreditation and quality assurance,⁴⁸ including double-blind proficiency tests for forensic scientists,⁴⁹ should be implemented.
- Forensic laboratories and scientists should be independent of law enforcement,⁵⁰ a step that has already been taken in Great Britain and parts of Australia.⁵¹ This would take forensic scientists off the prosecution “team” and also give defendants access to leading experts who are unavailable to them under current law.
- “Rivalrous redundancy should replace monopoly.”⁵² Instead of one forensic lab in each jurisdiction, there should be several competing labs.⁵³ When feasible, evidence chosen at random should be sent to different labs, and divergent results should be investigated to see where the error lies.⁵⁴ A lab with a high error rate failing to aggressively reform its practices would lose credibility. Relatedly, if forensic science is privatized, labs that lose credibility would also lose business, giving them an incentive to reform.⁵⁵
- A national forensic institute should be established to validate technologies and methodologies and to set standards for the interpretation of data.⁵⁶
- Indigents should be provided with forensic counsel⁵⁷ or provided with court-appointed experts to review the prosecution’s forensic evidence.⁵⁸

47. Neufield, *supra* note 22, at S111–12.

48. Am. Bar Ass’n Criminal Justice Section, *Report No. 2 of the Criminal Justice Section, in* 129(2) REPORTS OF A.B.A. 349, 352–56 (2004); Neufield, *supra* note 22, at S112–13.

49. NATIONAL RESEARCH COUNCIL, DNA TECHNOLOGY IN FORENSIC SCIENCE 55 (1992) (“No laboratory should let its results with a new DNA typing method be used in court, unless it has undergone . . . proficiency testing via blind trials.”); Am. Bar Ass’n Criminal Justice Section, *supra* note 48, at 354–55; Risinger et al., *supra* note 22, at 45–47.

50. See STATE OF ILLINOIS, REPORT OF THE GOVERNOR’S COMMISSION ON CAPITAL PUNISHMENT 52–54 (2002); see also Neufield, *supra* note 22, at S111; Michael J. Saks et al., *Model Prevention and Remedy of Erroneous Convictions Act*, 33 ARIZ. ST. L.J. 665, 698 (2001) (proposing a governmental “Forensic Science Service” to “provide forensic science services to police, prosecutors, defense counsel, judges, and pro se defendants concerned with criminal cases”).

51. See Bernstein, *supra* note 33, at 161–62, 171–72.

52. Koppl, *supra* note 22, at 259.

53. *Id.*

54. *Id.*

55. *Id.*

56. *Id.*

57. Am. Bar Ass’n Criminal Justice Section, *supra* note 48, at 357; Koppl, *supra* note 22, at 259.

58. Giannelli, *supra* note 43, at 1332.

All of these suggestions have merit. Proposals to create a competitive forensic science system that would provide economic incentives for reliability to replace the current government-run “command and control” system are particularly intriguing. The need for such reforms underscores the point that *Daubert*’s reliability test cannot, in the absence of broader measures, resolve the problems attendant to the use of forensic science in court.

III. EXPERT TESTIMONY REGARDING CAUSATION IN TOXIC TORT LITIGATION

The *Daubert* trilogy and the subsequent amendments to Rule 702 have their origins in toxic tort and pharmaceutical litigation cases (hereinafter, “toxic tort cases”) in which the admissibility of causation testimony was disputed.⁵⁹ In one sense, Rule 702 neatly resolves the controversy over the admissibility of such evidence by stating that expert testimony is admissible only if “the testimony is the product of reliable principles and methods” and “the witness has applied the principles and methods reliably to the facts of the case.”⁶⁰ Because speculation is by definition unreliable, this standard suggests that speculative testimony by plaintiffs’ experts—which, as discussed below, is all that plaintiffs are usually able to present—is not admissible under Rule 702.

Meeting Rule 702’s reliability standard usually would require sound epidemiological evidence showing that the ratio of relative risk of causation of the injury-in-question from the relevant level of exposure to the substance-at-issue is greater than two.⁶¹ A relative risk above two suggests that the plaintiff’s injury was more probably than not a result of exposure to the substance.⁶² Even if a plaintiff had other evidence suggesting “general causation” that the substance at issue *can* cause the injury at issue, the plaintiff usually would still need the epidemiological evidence to prove specific causation, i.e., that exposure to the relevant substance caused the particular plaintiff’s injury.

59. Most of the cases that generated the “junk science” controversy in the 1980s and early 90s were toxic tort cases. See generally KENNETH R. FOSTER ET AL., *PHANTOM RISK: SCIENTIFIC INFERENCE AND THE LAW* (1993) (reviewing many of these cases and comparing the conclusions of scientists in reviews of the relevant scientific literature to how the courts treated the same issues). For anecdotal accounts of many of these cases, see generally PETER W. HUBER, *GALILEO’S REVENGE: JUNK SCIENCE IN THE COURTROOM* (1990); HANS ZEISEL & DAVID KAYE, *PROVE IT WITH FIGURES: EMPIRICAL METHODS IN LAW AND LITIGATION* 45–68 (1997). *Daubert* and *Joiner* both revolved around the admissibility of expert causation testimony.

60. FED. R. EVID. 702.

61. See, e.g., *Daubert v. Merrell Dow Pharms., Inc.*, 43 F.3d 1311, 1321 (9th Cir. 1995) (holding that for epidemiological testimony to be admissible to prove specific causation under *Daubert*, the plaintiff must have had a relative risk greater than two).

62. See Michael D. Green et al., *Reference Guide on Epidemiology*, in REFERENCE MANUAL ON SCIENTIFIC EVIDENCE 333, 384 (Fed. Judicial Ctr. ed., 2d ed. 2000). Of course, this is an oversimplification of the relationship between relative risk and causation, but it will do for present purposes.

Instead, plaintiffs typically rely on evidence that is directly suggestive (at most) only of general causation. For example, a plaintiff in a typical toxic tort case may rely on any or all of the following types of evidence: animal studies usually involving much higher relative exposure to the substance at issue; laboratory studies on cells; anecdotal case reports; the temporal relationship between exposure and disease; regulatory actions by the government; analogy to similar substances known to cause disease; studies on humans involving much higher exposure levels; and epidemiological studies that are too preliminary to be of much value (if, for example, their sample size is too small), or are suggestive but not statistically significant, or have a relative risk well below two.⁶³

Extrapolating from such evidence to specific causation requires a certain amount of speculation or educated guesswork.⁶⁴ Many testifying experts try to give their speculation a scientific-sounding spin by claiming that they have undertaken a “differential diagnosis” (really a differential etiology)⁶⁵ in which they have considered and eliminated other plausible causes of the disease. Despite the pretensions of “science,” the substance of such testimony usually amounts to this: in the absence of some other known causal mechanism, I speculate that the product or substance at issue in this case caused the plaintiff’s injury.⁶⁶

63. For a discussion of the difficulty in extrapolating causation from these types of evidence, see David E. Bernstein, *The Admissibility of Scientific Evidence After Daubert v. Merrell Dow Pharmaceuticals, Inc.*, 15 CARDOZO L. REV. 2139, 2170–72 (1994). See also David H. Kaye & David A. Freedman, *Reference Guide on Statistics*, in REFERENCE MANUAL ON SCIENTIFIC EVIDENCE, *supra* note 62, at 83, 91–92 (discussing the general unreliability of anecdotal evidence of causation). See generally Gary Taubes, *Epidemiology Faces Its Limits*, 269 SCIENCE 164 (1995) (noting that epidemiology is subject to systematic errors, biases, and confounders).

64. Even in the best of circumstances, toxicology “is both a science and an art,” Michael A. Gallo, *History and Scope of Toxicology*, in CASSARETT AND DOULL’S TOXICOLOGY 3 (Curtis D. Klassen ed., 2001), and the available evidence of causation in most toxic tort cases presents nothing remotely close to the best of circumstances. Professor Carl Cranor, in correspondence with the author, suggests that the category the author identifies as “speculation” includes what logicians would call “non-deductive reasoning.” That seems right, but to those who use the scientific method, which relies on deductive reasoning, “non-deductive reasoning” would still come within the broad category of “speculation,” or at least “educated guess.” Nevertheless, Cranor is correct to point out that what the author identifies as “speculation” may sometimes have substantially more probative value than what people refer to as “speculation” in ordinary conversation.

65. See Joseph Sanders & Julie Machal-Fulks, *The Admissibility of Differential Diagnosis Testimony to Prove Causation in Toxic Tort Cases: The Interplay of Adjective and Substantive Law*, L. & CONTEMP. PROBS., Autumn 2001, at 107, 108 (noting that “differential etiology” is a more appropriate description).

66. See Edward J. Imwinkelried, *The Admissibility and Legal Sufficiency of Testimony About Differential Diagnosis (Etiology): Of Under- and Over-Estimations*, 56 BAYLOR L. REV. 391, 406 (2004) (noting that an opinion based on differential etiology “seems to be at most an educated guess” with regard to general causation); see also *Viterbo v. Dow Chem. Co.*, 826 F.2d 420, 424 (5th Cir. 1987) (“Dr. Johnson’s testimony is no more than Viterbo’s testimony dressed up and sanctified as the opinion of an expert. Without more than credentials and subjective opinion, an expert’s

Pre-*Daubert*, many judges and commentators argued that, given the evidentiary challenges faced by plaintiffs, such testimony, even if not reliable, should be admissible to prove causation. *Ferebee v. Chevron*, arguably the leading case on the admissibility of expert testimony in toxic tort cases pre-*Daubert*, adopted this perspective.⁶⁷ *Ferebee* involved a claim that exposure to an herbicide caused an individual's cancer.⁶⁸ The case involved a unique workplace exposure⁶⁹ and, therefore, no epidemiological data was available. Instead, the plaintiff's experts relied on "tissue samples, standard tests,⁷⁰ and patient examination" to support his causation testimony.⁷¹

The *Ferebee* court held that this testimony was admissible because the "basic methodology" used by the expert was "sound,"⁷² even though the expert's conclusion was obviously speculative. The court explained:

[P]roducts liability law does not preclude recovery until a "statistically significant" number of people have been injured or until science has had the time and resources to complete sophisticated laboratory studies of the chemical. . . . [T]he fact that . . . science would require more evidence before conclusively considering the causation question resolved is irrelevant.⁷³

Ferebee gave far too much weight to a qualified expert's willingness to testify that exposure to a particular substance caused a plaintiff's injury. In particular, *Ferebee* implicitly condoned treating plaintiffs' experts in toxic tort cases as if their status as qualified experts meant that their reasoning and

testimony that 'it is so' is not admissible."); *Cavallo v. Star Enter.*, 892 F. Supp. 756, 771 (E.D. Va. 1995) (stating that it is not enough for an expert to rule out other possible causes if he has no evidence that allows him to "rule in" the purported cause), *aff'd in part, rev'd in part*, 100 F.3d 1150 (4th Cir. 1996).

67. *Ferebee v. Chevron Chem. Co.*, 736 F.2d 1529, 1535-36 (D.C. Cir. 1984); *accord* *City of Greenville v. W.R. Grace & Co.*, 827 F.2d 975, 978-82 (4th Cir. 1987); *Wells v. Ortho Pharm. Corp.*, 788 F.2d 741, 745 (11th Cir. 1986); *Bandura v. Orkin Exterminating Co.*, 664 F. Supp. 1218, 1219 (N.D. Ill. 1987), *aff'd*, 865 F.2d 816, 817 (7th Cir. 1988). *See generally* Alain Golanski, *Judicial Scrutiny of Expert Testimony in Environmental Tort Litigation*, 9 PACE ENVTL. L. REV. 399, 406 (1992) (noting that *Ferebee* was frequently cited as a leading case favoring liberal standards for the admissibility of expert causation testimony). Some *Frye* courts continue to utilize similar reasoning in defending their choice not to scrutinize plaintiffs' experts' reasoning in toxic tort cases. *See, e.g.*, *Nonnon v. City of New York*, 819 N.Y.S.2d 705, 715 (N.Y. App. Div. 2006) (refusing to apply *Frye* toxic-exposure cases because applying the general acceptance test to such cases would prevent plaintiffs "suffering the ill effects . . . of environmental contaminants" from obtaining compensation).

68. *Ferebee*, 736 F.2d at 1533

69. *Id.* at 1531-32.

70. The court did not identify "standardized tests" in its opinion.

71. *Ferebee*, 736 F.2d at 1536.

72. *Id.* at 1535-36.

73. *Id.* at 1536

conclusions necessarily reflected the views of a reputable segment of their scientific peers.⁷⁴

However, due to adversarial bias—in this context, selection bias—this assumption is unsupportable. A toxic tort plaintiff with even marginally suggestive evidence of general causation will have no trouble finding qualified experts from among tens of thousands of at least minimally qualified American physicians, toxicologists, etc., who are willing to testify that specific causation should be extrapolated from such evidence.⁷⁵

Ferebee reflected and encouraged a generally lax attitude toward the admissibility of expert testimony in toxic tort cases. Judges were disinclined to enforce a reliability test against plaintiffs in such cases because the litigation often pitted a completely innocent plaintiff against a defendant who had misbehaved.⁷⁶ Under such circumstances, if defendants did not

74. *Id.* The court added that even if this “case may have been the first of its exact type, or that his doctors may have been the first alert enough to recognize such a case, [this] does not mean that the testimony of those doctors, who are concededly well qualified in their fields, should not have been admitted.” *Id.*

75. Indeed, thanks to *Ferebee*-like admissibility standards, the 1980s became the courtroom heyday of “clinical ecologists”—quacks, often with medical degrees or Ph.Ds, who claimed that even brief exposure to a toxic substance destroyed an individual’s immune system and left him vulnerable to all manner of illnesses. *See, e.g.,* *Sterling v. Velsicol Chem. Corp.*, 855 F.2d 1188, 1200–01 (6th Cir. 1988) (excluding such testimony); *Elam v. Alcolac, Inc.*, 765 S.W.2d 42, 43 (Mo. Ct. App. 1988) (affirming a large verdict based on such testimony). Any malady suffered by an exposed plaintiff, ranging from a snuffle to fatal cancer, could thus be attributed to even minute exposure to any given chemical. *See* Eliot Marshall, *Immune System Theories on Trial*, 234 SCIENCE 1490, 1491 (1986); *see also* D. Michael Risinger, *A Functional Taxonomy of Expertise*, in 1 MODERN SCIENTIFIC EVIDENCE: THE LAW AND SCIENCE OF EXPERT TESTIMONY § 2:15, at 106 (David L. Faigman, David H. Kaye, Michael J. Saks & Joseph Sanders eds., 2d ed. 2005) (“[T]here is no shortage of credentialed scientists in the world who will confuse hypothesis with confirmed fact, and testify (sincerely), to the actual existence of causal relations or substantially enhanced risks on weak or no evidence.”).

Not only did the problem of adversarial bias seem not to have occurred to the *Ferebee* court, it does not seem to have occurred to some learned commentators, even years later. Professor Cranor, for example, has written an extremely interesting and lengthy book arguing that courts have applied *Daubert* too strictly in toxic tort cases, yet his argument progresses as if plaintiffs’ experts in toxic tort cases represent a random sampling of scientific opinion. *See generally* CARL F. CRANOR, *TOXIC TORTS: SCIENCE, LAW, AND THE POSSIBILITY OF JUSTICE* (2006). *See also* Jean Macchiaroli Eggen, *Clinical Medical Evidence of Causation in Toxic Tort Cases: Into the Crucible of Daubert*, 38 HOUS. L. REV. 369, 409–12 (2001) (neglecting the issue of adversarial bias).

76. For example, the defendant may have exposed the plaintiff to an involuntary risk, such as a company spilling chemicals into drinking water or onto a local street. *See, e.g.,* *Reuters, Settlement is Reached for 128 Dioxin Victims*, N.Y. TIMES, Nov. 20, 1986, at B18; *Verdict Returned for Chemical Companies in Case by Former Times Beach Residents*, 12 Chem. Reg. Rep. (BNA) 424 (June 17, 1988). The defendant may have failed to warn about a known or suspected risk from a product or substance used by the plaintiff. *See, e.g.,* *Brochu v. Ortho Pharm. Corp.*, 642 F.2d 652, 658–59 (1st Cir. 1981); *Wooderson v. Ortho Pharm. Corp.*, 681 P.2d 1038, 1057 (Kan. 1984). Alternatively, a defendant may not have tested a product or substance sufficiently to rule out potential risk before putting it on the market or exposing employees or the general public to the possible risk. *See* JOSEPH SANDERS, *BENDECTIN ON TRIAL* 62 (1998) (concluding that

have sufficient evidence to *disprove* causation,⁷⁷ many courts admitted dubious expert testimony⁷⁸ and allowed plaintiffs to present their cases to the jury, effectively permitting juries to relax causation requirements to punish defendants.⁷⁹ The result was a growing number of jury verdicts in

Merrell Dow Pharmaceuticals did not research the safety of Bendectin before marketing it); David E. Bernstein, *The Breast Implant Fiasco*, 87 CAL. L. REV. 457, 462 (1999) (noting that Marcia Angell, author of a book on breast implants, concludes that breast-implant manufacturers did not engage in sufficient safety research before marketing implants).

77. Defendants sometimes did have such evidence, as in the latter stages of the Bendectin litigation. This led to a series of evidentiary rulings favorable to defendants, including the *Daubert* opinion. See SANDERS, *supra* note 76, at 153–56.

78. For example, courts often admitted expert testimony of causation based on high-dose animal studies. See, e.g., *In re Paoli R.R. Yard PCB Litig.*, 916 F.2d 829, 862 (3d Cir. 1990) (reversing the district court's exclusion of animal studies); *Villari v. Terminix Int'l, Inc.*, 692 F. Supp. 568, 571 (E.D. Pa. 1988) (admitting testimony based on animal studies because "a substantial portion of the scientific community relies on animal studies of this type in assessing health risks to humans"); *Marder v. G.D. Searle & Co.*, 630 F. Supp. 1087, 1094 (D. Md. 1986) ("There is a range of scientific methods for investigating questions of causation—for example, toxicology and animal studies, clinical research, and epidemiology—which all have distinct advantages and disadvantages."), *aff'd sub nom. Wheelahan v. G.D. Searle & Co.*, 814 F.2d 655 (4th Cir. 1987). That is not to say that animal studies can never be reliable evidence of causation, at least when used as part of a broader evidentiary presentation. The problem is that courts often relied on dubious reasoning, as in the *Villari* case quoted above, when they admitted evidence based on such studies.

Some courts were much stricter than the D.C. Circuit was in *Ferebee* about admitting plaintiffs' causation evidence. The leading strict-scrutiny case before *Daubert* was *In re Agent Orange Prod. Liab. Litig.*, 611 F. Supp. 1223, 1243–48 (E.D.N.Y. 1985) (excluding expert witness testimony linking Agent Orange to plaintiffs' injuries after adopting a narrow interpretation of Rule 703), *aff'd on other grounds*, 818 F.2d 187, 189 (2d Cir. 1987).

79. The perceived blameworthiness of the defendant may play a larger role than scientific evidence in jury verdicts. See Bernstein, *supra* note 76, at 473, 478, 486 (explaining that attorneys in the breast implant litigation focused heavily on "bad documents" purporting to show defendants' misconduct); see also E. Donald Elliott, *Why Courts? Comment on Robinson*, 14 J. LEGAL STUD. 799, 801–02 (1985); Edwin J. Jacob, *Of Causation in Science and Law: Consequences of the Erosion of Safeguards*, 40 BUS. LAW. 1229 *passim* (1985). Indeed, Margaret Berger has argued that proof of causation should be dispensed with entirely in toxic tort cases involving malfeasance by the defendant. Margaret A. Berger, *Eliminating General Causation: Notes Towards a New Theory of Justice and Toxic Torts*, 97 COLUM. L. REV. 2117, 2143–52 (1997); see also Heidi Li Feldman, *Science and Uncertainty in Mass Exposure Litigation*, 74 TEX. L. REV. 1, 45 (1995) (suggesting that courts might shift the burden of proof on causation in the toxic tort context "whenever the plaintiff could establish strong uncertainty about general causation"); Wendy E. Wagner, *Choosing Ignorance in the Manufacture of Toxic Products*, 82 CORNELL L. REV. 773, 833–41 (1997) (proposing that, in the mass-tort context, the burden of proof should be reversed if the defendant was negligent in failing to properly test a potentially dangerous substance before exposing thousands of people to that substance). See generally Allen v. United States, 588 F. Supp. 247, 415 (D. Utah 1984) (holding in a toxic tort case that the jury may find for the plaintiff "absent persuasive proof to the contrary offered by the defendant"); Thomas W. Henderson, *Toxic Tort Litigation: Medical and Scientific Principles in Causation*, 132 AM. J. EPIDEMIOLOGY S69 (1990) (arguing that in toxic tort cases courts should shift the burden of proof to the defendants to prove that they did not cause the plaintiff's injury); Ariel Porat & Alex Stein, *Liability for Uncertainty: Making Evidential Damage Actionable*, 18 CARDOZO L. REV. 1891, 1941 (1997) (stating that when a defendant is responsible for uncertainty regarding

toxic tort cases that bore little relationship to any extant reliable scientific evidence but bore a strong relationship to the presence of sympathetic plaintiffs and unsympathetic defendants.⁸⁰ Research on certain categories of products, including contraceptives and vaccines, declined dramatically as companies chose to avoid the possibility of having to defend their products from junk science.⁸¹

Eventually, concern over the rise of junk science in toxic tort cases, spurred by a few particularly controversial verdicts⁸² and magnified by the attention received by Peter Huber's influential polemic, *Galileo's Revenge: Junk Science in the Courtroom*,⁸³ led to a backlash⁸⁴ against let-it-all-in evidentiary standards⁸⁵ exemplified by *Ferebee*. *Daubert* adopted a reliability test for expert testimony and suggested that trial courts look to such factors as peer review, rate of error, and general acceptance in determining the admissibility of expert testimony. This opinion, along with some influential lower court opinions,⁸⁶ gave defense attorneys the tools they needed to

causation, the burden of proof may be shifted). For an argument against eliminating the normal causation requirement, see Bernstein, *supra* note 76, at 504–06.

80. Moreover, plaintiffs' attorneys, concerned with the bottom line, tended to expend their resources on cases with the potential for huge damages awards, such as cases alleging causation of birth defects or other lifelong injury to a child. See Bernstein, *supra* note 76, at 461–62 (noting that the financial incentives of plaintiffs' attorneys are a primary driving force of litigation involving "phantom risks").

81. See Peter Huber, *Litigation Thwarts Innovation in the U.S.*, SCI. AM., Mar. 1989, at 120, 120; see also Elizabeth B. Connell, Editorial, *The Cost of Frivolous Lawsuits*, FAM. PRAC. NEWS, Jan. 15, 2004, at 14, 14, available at <http://www.familypracticenews.com/article/PIIS0300707304712220/fulltext> (discussing contraceptive research); Henry I. Miller, Editorial, *How Lawsuits Can Kill*, SCRIPPS HOWARD NEWS SERV., Dec. 9, 2004, available at http://www.shns.com/shns/g_index2.cfm?action=detail&pk=FLU-12-09-04 (discussing vaccine research).

82. See, e.g., *Wells v. Ortho Pharm. Corp.*, 615 F. Supp. 262 (N.D. Ga. 1985), *aff'd in part, modified in part*, 788 F.2d 741 (11th Cir. 1986) (upholding an award of more than five million dollars for birth defects allegedly caused by spermicide). For harsh criticism, see generally James L. Mills & Duane Alexander, *Occasional Notes: Teratogens and "Litogens,"* 325 NEW ENG. J. MED. 1234 (1986); *Federal Judges vs. Science*, N.Y. TIMES, Dec. 27, 1986, at 22.

83. In the interest of full disclosure, the author notes that he was a research assistant for this book, HUBER, *supra* note 59.

84. See, e.g., *Daubert v. Merrell Dow Pharms., Inc.*, 951 F.2d 1128, 1129–30 (9th Cir. 1991) (applying the general acceptance test to uphold the exclusion of evidence indicating that Bendectin caused the plaintiffs' birth defects); *Christophersen v. Allied-Signal Corp.*, 939 F.2d 1106, 1110 (5th Cir. 1991) (adopting a strict test for the admissibility of expert testimony, including a general acceptance requirement).

85. See *In re Air Crash Disaster at New Orleans, La.*, 795 F.2d 1230, 1234 (5th Cir. 1986) (complaining that unreliable expert testimony is "simply tossed off to the jury under a 'let it all in' philosophy").

86. See, e.g., *Daubert v. Merrell Dow Pharms., Inc.*, 43 F.3d 1311, 1320 (9th Cir. 1995) (rejecting, on remand, the causation testimony presented to the court in *Daubert*); *Claar v. Burlington N. R.R. Co.*, 29 F.3d 499, 501 (9th Cir. 1994) (emphasizing that a district court is "both authorized and obligated to scrutinize carefully the reasoning and methodology" underlying an expert's proffered testimony).

persuade courts to serve as much stricter evidentiary “gatekeepers” in toxic tort cases.

Post-*Daubert*, courts became increasingly (but not universally)⁸⁷ strict about admitting causation testimony.⁸⁸ This trend accelerated after the

87. See, e.g., *Ambrosini v. Labarraque*, 101 F.3d 129, 138–39 (D.C. Cir. 1996) (citing and applying *Ferebee* and holding that speculative expert testimony that Depo Provera caused the plaintiff’s birth defects was admissible because there was no contrary body of epidemiological data); *McCulloch v. H.B. Fuller Co.*, 61 F.3d 1038, 1043 (2d Cir. 1995) (upholding the admission of a treating physician’s testimony that glue fumes caused the plaintiff’s throat polyps, despite the absence of any scientific literature suggesting such a relationship); *Hopkins v. Dow Corning Corp.*, 33 F.3d 1116, 1124–25 (9th Cir. 1994) (holding that the *Daubert* inquiry ends when the court has determined that the expert is using a methodology appropriate for the general subject at issue, and that the court should not explore whether the study upon which the expert relied can validly support her conclusions); see also Kenneth J. Chesebro, *Taking Daubert’s “Focus” Seriously: The Methodology/Conclusion Distinction*, 15 CARDOZO L. REV. 1745, 1746 (1994) (claiming that under *Daubert*, courts may not scrutinize an expert’s reasoning process); Michael H. Gottesman, *Admissibility of Expert Testimony After Daubert: The “Prestige” Factor*, 43 EMORY L.J. 867, 869–72 (1994) (contending that the *Daubert* test is a liberal, forgiving test). The Third and Eleventh Circuits even held that they would give a “hard look” to cases in which a lower court made a *Daubert* ruling in a toxic tort case, but only when the court ruled testimony inadmissible. See *Joiner v. Gen. Elec. Co.*, 78 F.3d 524, 529 (11th Cir. 1996) (“[W]e apply a particularly stringent standard of review to the trial judge’s exclusion of expert testimony.”), *rev’d*, 522 U.S. 136 (1997); *In re Paoli R.R. Yard PCB Litig.*, 35 F.3d 717, 763–65 (3d Cir. 1994) (“[W]hen the district court’s exclusionary evidentiary rulings with respect to scientific opinion testimony will result in a summary or directed judgment, we will give them a ‘hard look’ . . . to determine if a district court has abused its discretion in excluding evidence as unreliable.”).

88. See, e.g., *Daubert*, 43 F.3d at 1319 (“We’ve been presented with only the experts’ qualifications, their conclusions and their assurances of reliability. Under *Daubert*, that’s not enough.”). A number of courts reject case reports as evidence of causation under *Daubert*. See *Pick v. Am. Med. Sys. Inc.*, 958 F. Supp. 1151, 1161–62 (E.D. La. 1997) (noting that “courts have frequently rejected case studies as an insufficient basis to decide causation when they lack control groups” and that “the individual reports cited must be shown to be independently reliable under *Daubert* before they can be admitted”); *Haggerty v. Upjohn Co.*, 950 F. Supp. 1160, 1165 (S.D. Fla. 1996) (“[W]hile case reports may provide anecdotal support, they are no substitute for a scientifically designed and conducted inquiry.”), *aff’d*, 158 F.3d 588 (11th Cir. 1998); *Hall v. Baxter Healthcare*, 947 F. Supp. 1387, 1411 (D. Or. 1996) (“[C]ase reports and case studies are universally regarded as an insufficient scientific basis for a conclusion regarding causation because case reports lack controls.”); *Muzzey v. Kerr-McGee Chem. Corp.*, 921 F. Supp. 511, 519 (N.D. Ill. 1996) (stating that “anecdotal reports may be an incentive for more careful investigation” but “are not reliable bases to form a scientific opinion about a causal link”); *Casey v. Ohio Med. Prods.*, 877 F. Supp. 1380, 1385 (N.D. Cal. 1995) (“Such case reports are not reliable scientific evidence of causation”); *Wade-Greaux v. Whitehall Labs.*, 874 F. Supp. 1441, 1453 (D.V.I. 1994). The court stated:

[Case] reports record nothing more than a temporal association between an exposure and a particular occurrence. . . . Because of individual confounding factors, one cannot draw causation conclusions from such anecdotal data. . . . Epidemiologists use their population studies to eliminate the chance associations and confounding factors, which inherently infect anecdotal reports, to determine whether a statistically significant positive association exists.

Id.

Supreme Court's decision in *General Electric Co. v. Joiner*.⁸⁹ In *Joiner*, the plaintiff's experts relied on rodent studies and sketchy epidemiological data to show that exposure to PCBs caused the decedent's lung cancer.⁹⁰ The Supreme Court deemed these studies unreliable and, reversing the Eleventh Circuit, upheld their exclusion by the district court, concluding "nothing in either *Daubert* or the Federal Rules of Evidence requires a district court to admit opinion evidence that is connected to existing data only by the *ipse dixit* of the expert."⁹¹ This decision sent a powerful signal to lower courts that they should exclude speculative, unreliable expert testimony on causation.⁹²

Some courts nevertheless remained very reluctant to exclude speculative causation testimony because such exclusion inevitably resulted in granting summary judgment to the defense. The Second Circuit's opinion in *Zuchowicz v. United States* illustrates this reluctance.⁹³ In *Zuchowicz*, the

89. Gen. Elec. Co. v. Joiner, 522 U.S. 136, 146 (1997).

90. *Id.* at 143–46.

91. *Id.* at 146. The Court added that "[a] court may conclude that there is simply too great an analytical gap between the data and the opinion proffered." *Id.*

92. See Margaret A. Berger & Aaron D. Twerski, *Uncertainty and Informed Choice: Unmaking Daubert*, 104 MICH. L. REV. 257, 263 (2005) (reporting that "the *Joiner* Court endorsed an approach that provided trial courts with a template for excluding expert testimony on causation"). For example, the Eleventh Circuit, which had issued a "loose scrutiny" opinion in *Joiner*, issued a much stricter ruling in *Allison v. McGhan Medical Corp.*, 184 F.3d 1300, 1314–15 & n.16 (11th Cir. 1999). After *Joiner*, courts became increasingly likely to reject anecdotal case reports as evidence of causation. See, e.g., *Glastetter v. Novartis Pharms. Corp.*, 107 F. Supp. 2d 1015, 1028–31 (E.D. Mo. 2000); *Hollander v. Sandoz Pharms. Corp.*, 95 F. Supp. 2d 1230, 1235–38 (W.D. Okla. 2000); *Brumbaugh v. Sandoz Pharm. Corp.*, 77 F. Supp. 2d 1153, 1157 (D. Mont. 1999); *In re Breast Implant Litig.*, 11 F. Supp. 2d 1217, 1227–28 (D. Colo. 1998) ("To the extent there are case or anecdotal reports noting various symptoms or signs in breast implanted women, without controls, these suggest only a potential, untested hypothesis that breast implants may be their cause."); *Willert v. Ortho Pharm. Corp.*, 995 F. Supp. 979, 981 (D. Minn. 1998) (concluding that case reports are not sufficient evidence of causation because they do not exclude other alternative explanations). Other courts rejected chemical structure analysis as evidence of causation. See, e.g., *Schudel v. Gen. Elec. Co.*, 120 F.3d 991, 996–97 (9th Cir. 1997); *Brumbaugh*, 77 F. Supp. 2d at 1157. See generally Daniel J. Capra, *The Daubert Puzzle*, 32 GA. L. REV. 699, 715 (1998) ("One example of improper extrapolation is an expert's use of structure analysis."). For post-*Joiner* cases rejecting reliance on government regulatory action to prove causation, see *Glastetter*, 107 F. Supp. 2d at 1036 and *Hollander*, 95 F. Supp. 2d at 1234 n.9.

For a post-*Joiner* concession of defeat by an advocate of forgiving standards for the admissibility of expert testimony, see Michael H. Gottesman, *From Barefoot to Daubert to Joiner: Triple Play or Double Error?*, 40 ARIZ. L. REV. 753, 755 (1998).

93. *Zuchowicz v. United States*, 140 F.3d 381 (2d Cir. 1998); see also *Westbury v. Gislated Gummi AB*, 178 F.3d 257, 264 (4th Cir. 1999) (allowing an expert to opine that exposure to talc aggravated the plaintiffs' sinus condition, despite the absence of published scientific literature on the subject); *Heller v. Shaw Indus., Inc.*, 167 F.3d 146, 154, 156–57 (3d Cir. 1999) (finding that a differential diagnosis provided sufficiently reliable proof of causation, even in the absence of published studies ruling in general causation by the substance at issue); *Kennedy v. Collagen Corp.*, 161 F.3d 1226, 1228–31 (9th Cir. 1998) (concluding that the district court had erred in excluding causation testimony that was based upon a differential diagnosis).

plaintiff alleged that exposure to an overdose of Danocrine caused the decedent to die of a rare disease called primary pulmonary hypertension, or PPH.⁹⁴

The rarity of PPH, combined with the rarity of anyone receiving such a high dose of Danocrine, meant that not only had the causation issue in *Zuchowicz* never been studied in a scientifically rigorous way, but also that it never could be.⁹⁵ Nevertheless, the plaintiff found two experts willing to testify that Danocrine caused the decedent's PPH.⁹⁶ Even though the experts presented, at best, "educated guesses"⁹⁷ or "conjecture,"⁹⁸ the Second Circuit upheld the district court's ruling that their testimony was admissible under *Daubert* and *Joiner*. The court concluded that when direct studies of the association in humans between a rare disease and a drug are not possible, *Daubert* and *Joiner* allow medical opinions such as the opinions of the plaintiff's experts based on the exclusion of other drugs as the cause (differential etiology) and an untested, speculative theory as to how the drug might have produced the disease.⁹⁹

Arguably, *Zuchowicz* violated only the spirit, but not the letter, of *Joiner*. *Joiner* permitted and encouraged, but did not explicitly require, a district court to examine the reliability of an expert's reasoning processes. In the absence of such an explicit requirement, the Second Circuit could plausibly conclude that the district court's decision was not an abuse of discretion.¹⁰⁰

Most observers, however, thought that the *Joiner* Court sought to require district courts to examine experts' reasoning processes. The amended version of Rule 702, enacted in 2000, codifies that understanding of *Joiner*. Amended Rule 702 requires both that "the testimony is the product of reliable principles and methods" (such as differential etiology) and also that "the witness has applied the principles and methods reliably to the facts of the case" (such as relying on a differential etiology only when the underlying causal relationship posited is supported by independent, reliable evidence).¹⁰¹ Experts relying on informed speculation and educated guesses,

94. *Zuchowicz*, 140 F.3d at 384.

95. Gross & Mnookin, *supra* note 42, at 183–84.

96. One expert, a pharmacologist, presented a speculative hypothesis regarding the causal mechanism that he claimed allowed him to testify to a "reasonable degree of scientific certainty" that Danocrine "more likely than not" caused the decedent's PPH. *Zuchowicz*, 140 F.3d at 386. Another expert testified that he found causation from Danocrine based on a "differential etiology," which consisted of eliminating other known causes of PPH. *Id.* at 385.

97. Gross & Mnookin, *supra* note 42, at 184 (describing the experts' testimony as based on educated guesses).

98. KAYE ET AL., *supra* note 1, § 9.3.2(b), at 322 (describing the experts' testimony as based on conjecture).

99. *Zuchowicz*, 140 F.3d at 387.

100. Gen. Elec. Co. v. Joiner, 522 U.S. 118, 142–43 (1997).

101. FED. R. EVID. 702.

as in *Zuchowicz*, cannot show that they have applied “the principles and methods reliably to the facts of the case.”¹⁰²

Despite Rule 702’s explicit contrary demands, some courts continue to admit extremely dubious expert testimony on causation based on a “differential diagnosis,” “differential etiology,” or “clinical experience,”¹⁰³ sometimes in combination with other evidence that also does not meet Rule 702’s standards.¹⁰⁴ One court, defending the admissibility of speculative causation theories, even made the nonsensical assertion that “[i]n science, as in life, where there is smoke, fire can be inferred, subject to debate and further testing.”¹⁰⁵

Federal courts that continue to apply a forgiving admissibility test to expert causation evidence often rely on cases preceding the 2000 changes to Rule 702, going back at times to pre-*Joiner* or even pre-*Daubert* case law. Meanwhile, they ignore the language of Rule 702.¹⁰⁶ Some federal judges, in fact, appear unaware that Rule 702 was amended in 2000. A federal district court recently wrote that “Rule 702 of the Federal Rules of Evidence, as discussed and interpreted by the Supreme Court in *Daubert* . . . and *Kumho Tire* . . . controls the admissibility of expert testimony.”¹⁰⁷ It would have been a rather neat trick for the Supreme Court to have discussed and interpreted current Rule 702 in these cases, given that they were decided before current Rule 702 existed!

Eventually, the text of Rule 702 will sink in, and all but a few judicial outliers will apply that text to the admissibility of causation evidence in toxic tort cases. Compared to the *Ferebee* regime that virtually invited junk science, this is a vast improvement.

102. *Id.*; *cf.* *McClain v. Metabolife Int’l, Inc.*, 401 F.3d 1233, 1255 (11th Cir. 2005) (overturning a trial court admissibility ruling and jury verdict on this basis).

103. *See, e.g.*, *Kudabeck v. Kroger Co.*, 338 F.3d 856, 860–63 (8th Cir. 2003) (holding that a chiropractor’s testimony that a fall caused plaintiff’s degenerative disc disease satisfied *Daubert*); *Riley v. Target Corp.*, No. 4:05CV00729 JLH, 2006 WL 1028773, at *5 (E.D. Ark. Apr. 13, 2006) (holding that any flaws in a “differential diagnosis” go to weight, not admissibility, of expert testimony); *Perkins v. Origin Medsystems, Inc.*, 299 F. Supp. 2d 45, 57, 62 (D. Conn. 2004) (concluding that a clinician’s speculation based on her “experience” was admissible).

104. *In re Phenylpropanolamine (PPA) Prods. Liab. Litig.*, 289 F. Supp. 2d 1230, 1248 (W.D. Wash. 2003) (“[C]ase and adverse drug reports, textbooks and treatises, and the clinical experience of several experts . . . satisfies the mandate of *Daubert*.”); *Globetti v. Sandoz Pharms., Corp.*, 111 F. Supp. 2d 1174, 1176 (N.D. Ala. 2001) (holding that where epidemiological studies were not feasible, differential diagnosis, statements in textbooks, a possible mechanism, animal studies, and case reports satisfied *Daubert*).

105. *Brasher v. Sandoz Pharms. Corp.*, 160 F. Supp. 2d 1291, 1296 (N.D. Ala. 2001).

106. For discussions of this issue, see the Posting of David Bernstein to The Volokh Conspiracy, Courts Refusing to Apply Federal Rule of Evidence 702, http://www.volokh.com/posts/chain_1147021015.shtml (May 6, 2006, 09:29); Posting of David Bernstein to The Volokh Conspiracy, More on *Daubert* and Rule 702, <http://www.volokh.com/posts/1152214719.shtml> (June 6, 2006, 15:38).

107. *Ellipsis, Inc. v. The Color Works, Inc.*, 428 F. Supp. 2d 752, 757 (W.D. Tenn. 2006).

The caveat, however, is that Rule 702 may actually lead to the exclusion of too much evidence and deprive some deserving plaintiffs of an opportunity to present their cases to a jury. Occasionally, available anecdotal evidence is so strong as to create a reasonable inference of causation.¹⁰⁸ In other rare instances, various types of speculative evidence can be combined to create an “evidentiary mosaic” that would lead many, perhaps most, experts to conclude that causation has been proven by a preponderance of the evidence.¹⁰⁹ Such evidence should be considered presumptively reliable, but a trial court judge faces the problem of separating these unusual cases from the more common cases where evidence based on speculation amounts to “quackspertise.”

In the very insightful *Daubert* remand opinion, the Ninth Circuit sought to use an objective criterion to determine reliability when faced with contradictory conclusions on causation evidence provided by “respected, well-credentialed scientists about matters squarely within their expertise, in areas where there is no scientific consensus as to what is and what is not

108. See, e.g., *Wilson v. Petroleum Wholesale, Inc.*, 904 F. Supp. 1188, 1190 (D. Colo. 1995) (allowing an expert to testify that plaintiff’s hearing loss and tinnitus was caused by less than two minutes of exposure to loud noise from an air horn); see also KATHLEEN R. STRATTON ET AL., ADVERSE EVENTS ASSOCIATED WITH CHILDHOOD VACCINES: EVIDENCE BEARING ON CAUSALITY 22 (1994) (concluding that case reports can sometimes be persuasive evidence of causation of injury from a vaccine); Michael D. Green, *Expert Witnesses and Sufficiency of Evidence in Toxic Substances Litigation: The Legacy of Agent Orange and Bendectin Litigation*, 86 NW. U. L. REV. 643, 658 (1992) (“Occasionally, when the effect of the agent is powerful enough, scientists will tentatively accept case reports as sufficient to establish a causal relation.”). Green gives the example of Thalidomide, the ingestion of which has such a clear relationship with unusually severe and numerous birth defects that scientists accepted the causation hypothesis before epidemiological studies were completed. *Id.* at 658 n.68. Other examples are provided in CRANOR, *supra* note 75, at 115–25.

109. Professors Denbeaux and Risinger note:

It is not uncommon for causal relationships to be inferred by the convergence of information from various domains at some remove from the target issue, where the product of no single domain could be said to be a reliable indicator of causation by itself. This is not surprising. It is the normal way of circumstantial evidence, building walls by bricks in ordinary trials. When there are interlocking and mutually corroborating results from a variety of domains and studies that individually are all subject to plausible external validity objections, it would seem that exclusion based on external validity grounds ought to be approached with caution and an attempt at sophistication.

Denbeaux & Risinger, *supra* note 9, at 42.

The “mosaic” phrase comes from *Oxendine v. Merrell Dow Pharmaceuticals, Inc.*, 506 A.2d 1100, 1110 (D.C. 1986) (“Like the pieces of a mosaic, the individual studies showed little or nothing when viewed separately from one another, but they combined to produce a whole that was greater than the sum of its parts: a foundation for Dr. Done’s opinion that Bendectin caused appellant’s birth defects.”). This is not, however, an endorsement of the *Oxendine* opinion, which—in this author’s opinion—was wrong in holding that the plaintiffs’ evidence in that case provided an appropriate foundation to prove causation.

‘good science.’”¹¹⁰ Essentially, the court was concerned with the same issues identified here: what to do when qualified experts are willing to extrapolate from certain underlying premises to causation but cannot point to objective published studies that support their reasoning.

Judge Alex Kozinski, author of the opinion, identified selection bias (though he did not call it that) as a major underlying reason for *Daubert*'s promulgation of a reliability test. Judge Kozinski sought to combat selection bias, while still permitting reliable but not-yet-generally accepted causation evidence to be admitted. He therefore suggested a focus on whether experts are “proposing to testify about matters growing naturally and directly out of research they have conducted independent of the litigation or whether they have developed their opinions expressly for purposes of testifying.”¹¹¹

If an attorney limits himself to selecting experts who have undertaken research in a particular area before litigation commences, selection bias will be limited as the pool of available experts shrinks. The hired-gun problem will diminish as well because “when an expert prepares reports and findings before being hired as a witness, that record will limit the degree to which he can tailor his testimony to serve a party’s interests.”¹¹² Moreover, “independent research carries its own indicia of reliability, as it is conducted, so to speak, in the usual course of business and must normally satisfy a variety of standards to attract funding and institutional support.”¹¹³

Judge Kozinski’s argument is fine as far as it goes, but the legal standards for an expert to be “qualified” are sufficiently low and the level of quackery in the scientific community sufficiently high that to ensure that the expert’s testimony bears sufficient indicia of reliability judges must also consider other factors suggested by *Daubert* and its progeny. The Advisory Committee’s note to Rule 702 suggests the especially helpful criterion that an expert must use the same level of intellectual rigor in formulating his courtroom testimony that he used in the laboratory.¹¹⁴ This criterion, however, only works if the expert is actually a trained, practicing scientist. A clinical physician, to the extent the rules should permit him to testify to causation in toxic tort cases at all,¹¹⁵ must be held to the standard of research scientists. Otherwise, any physician who reaches a *post hoc ergo propter hoc* conclusion about what caused his patient’s illness could testify on the

110. *Daubert v. Merrell Dow Pharms., Inc.*, 43 F.3d 1311, 1316 (9th Cir. 1995).

111. *Id.* The Advisory Committee’s note to Rule 702 suggests this is a criterion courts may use to determine whether expert testimony is admissible. FED. R. EVID. 702 advisory committee’s note.

112. *Daubert*, 43 F.3d at 1317.

113. *Id.*

114. *See* FED. R. EVID. 702 advisory committee’s note (enunciating the “same level of intellectual rigor” standard).

115. For an argument that most clinical physicians are not competent, and thus not legally qualified, to testify regarding causation in toxic tort cases, see KAYE ET AL., *supra* note 1, ch. 2.

grounds that he reached his conclusion before the plaintiff's attorney contacted him.¹¹⁶

With that caveat, when a competent causation expert merely repeats conclusions she reached in a nonpartisan setting, the risks of adversarial bias are relatively low and implicit indicia of reliability relatively high. In such contexts, it would not be an abuse of discretion for the court to admit such an expert, even if the expert's conclusion includes a certain level of speculative extrapolation or educated guesswork. Courts faced with such experts should nevertheless consider retaining their own nonpartisan expert advisors to help ensure that the expert's testimony is within the bounds of what a scientist using appropriate methodology might reasonably conclude.

In any event, in many toxic tort cases, witnesses with pre-formed opinions will not be available to plaintiffs. This may occur when the issue at hand has not been studied in depth, the defendant employs the only researchers working on the issue in question, or the extant evidence is not sufficient for a nonpartisan scientist to make a pronouncement on human causation. In such cases, Rule 702 mandates exclusion in the absence of objective evidence supporting the reliability of the plaintiff's expert's testimony.

Before taking that drastic step, however, courts should consider Rule 702's underlying concern of adversarial bias and seek out experts with no stake in the litigation. Courts would ask such nonpartisan experts to opine as to whether the plaintiff's experts' informed speculations, or educated guesses, are consistent with what others in the field would conclude. Expert testimony that meets this standard should not be disregarded just because none of the individual pieces of evidence is reliable, or even because the conclusion itself cannot be proven to be reliable.

Put another way, one should not want or expect courts to make rulings on scientific issues contrary to what actual experts in the field would conclude.¹¹⁷ And if most nonpartisan scientists consulted on a particular

116. As an illustration, one of the leading plaintiffs' experts in the breast implant litigation was a practicing physician who happened to see several women who both had breast implants and suffered from an immune-system disease. He became curious about whether there might be a causal relationship between the implants and the disease. Other physicians, hearing of his interest in the matter, began to send patients to him who also had implants and immune-system troubles. Having seen this very skewed sample of breast implant recipients, he concluded that implants must cause immune-system disease. His testimony was held admissible just after *Daubert*, based on "medical records, his clinical experience, preliminary results of an [unpublished and never published] epidemiological study and medical literature." *Hopkins v. Dow Corning Corp.*, 33 F.3d 1116, 1125 (9th Cir. 1994). While this physician may have concluded before being asked to testify that breast implants cause immune-system disease, it would be foolish to conclude that his causation testimony was "reliable" merely on that basis.

117. See Alan W. Tamarelli, Jr., *Daubert v. Merrell Dow Pharmaceuticals: Pushing the Limits of Scientific Reliability—The Questionable Wisdom of Abandoning the Peer Review Standard for Admitting Expert Testimony*, 47 VAND. L. REV. 1175, 1176 (1994) (contending that other experts, not judges, are in the best position to make decisions about the reliability of scientific evidence).

issue were willing to reach a conclusion, albeit a speculative one, based on the existing evidence, a court should not exclude their views based on a legal standard of reliability, even if leading scientific journals would not yet be willing to publish their findings.

There are several countervailing considerations that must be taken into account. First, a scientific consensus based on an “educated guess” does not guarantee accuracy. Over the last several years, many well-accepted medical doctrines, based to a greater or lesser degree on “educated guesses” rather than truly reliable studies, have been severely challenged and in some cases rebutted entirely.

Famously, it turns out that a bacterial infection, not stress (as was believed for decades), is the primary cause of ulcers.¹¹⁸ For many years, obstetricians routinely performed episiotomies to assist in vaginal births, but recent research suggests that in most cases this procedure does more harm than good.¹¹⁹ For decades, doctors have been prescribing bed rest to prevent miscarriages without any meaningful empirical evidence of efficacy.¹²⁰ Recent research suggests that the risks of hormone replacement therapy for post-menopausal women outweigh its benefits for many women for whom it was previously recommended.¹²¹ Lactic acid, it turns out, is fuel for muscles and not a waste product that causes fatigue.¹²² Also, arthroscopic surgery to treat osteoarthritis might be useless.¹²³ Medical researchers once believed that eating fiber would prevent colon cancer. They relied on both small-

118. See generally Barry J. Marshall et al., *Prospective Double-Blind Trial of Duodenal Ulcer Relapse After Eradication of Campylobacter Pylori*, 332 LANCET 1437 (1988); NAT'L INSTS. OF HEALTH, NATIONAL INSTITUTES OF HEALTH CONSENSUS STATEMENT: HELICOBACTER PYLORI IN PEPTIC ULCER DISEASE (1994), available at <http://consensus.nih.gov/1994/1994HelicobacterPyloriUlcer094PDF.pdf>.

119. See Jay Goldberg et al., *The Philadelphia Episiotomy Intervention Study*, 51 J. REPROD. MED. 603, 603 (2006). Goldberg states:

Episiotomy, once a routine component of most vaginal deliveries, has become a procedure thought to be best avoided. Multiple studies over the past 20 years have concluded that while offering no maternal or neonatal benefit, midline episiotomy increases the risk of severe perineal lacerations, also involving the anal sphincter, along with risks of anal incontinence and rectovaginal fistula.

Id.; see also G. Carroli & J. Belizan, *Episiotomy for Vaginal Birth (Review)*, COCHRANE DATABASE OF SYSTEMATIC REVIEWS, July 26, 1999, at 1, 1–2, available at http://mrw.interscience.wiley.com/cochrane/clsysrev/articles/CD000081/pdf_fs.html (reviewing the literature).

120. See generally Alexandros Sotiriadis et al., *Threatened Miscarriage: Evaluation and Management*, 329 BRIT. MED. J. 152 (2004) (concluding that there is little evidence that bed rest prevents miscarriage).

121. Jacques E. Rossouw et al., *Risks and Benefits of Estrogen Plus Progestin in Healthy Postmenopausal Women: Principal Results from the Women's Health Initiative Randomized Controlled Trial*, 288 JAMA 321, 321 (2002).

122. Gina Kolata, *Lactic Acid Is Not Muscles' Foe, It's Fuel*, N.Y. TIMES, May 16, 2006, at F6.

123. J. Bruce Moesely et al., *A Controlled Trial of Arthroscopic Surgery for Osteoarthritis of the Knee*, 347 NEW ENG. J. MED. 81, 84–86 (2002).

scale studies and on the quite reasonable assumption that moving waste through the system more quickly would give toxins less time to harm the colon. Recent studies, however, call the connection between fiber intake and colon cancer into serious doubt.¹²⁴ And so on.

Even reliance on heavily cited studies can be problematic. Many initial studies, even when they are published in reputable scientific journals and achieve quick prominence, are contradicted by later, more accurate studies.¹²⁵ In short, educated guesses, even ones that have achieved consensus status in the scientific or medical community, are often wrong and are no substitute for reliable evidence when one is trying to determine the truth. For legal purposes, however, the operative question is whether such guesses are good enough to help resolve the issue at hand.

One potential objection to courts admitting educated guesses, even from nonpartisan experts, is that retaining neutral experts to opine on causation to overcome selection bias may introduce new biases into the system. Imagine a scientist who receives a call from a federal judge asking him to review the evidence regarding whether there is a strong causal connection between substance A and injury B. The judge explains that he is presiding over a class action involving thousands of plaintiffs who claim damages in excess of \$20 billion. While it is contrary to the scientific method and belied by prior litigation episodes in the United States,¹²⁶ it would be natural for this scientist to assume that if there is multi-billion dollar litigation over an issue, there is likely a plausible underlying basis for the litigation. Given the imprecision and subjectivity of informed speculation and educated guesses, this sort of bias can easily affect even a nonpartisan expert's conclusions.

124. C.S. Fuchs et al., *Dietary Fiber and the Risk of Colorectal Cancer and Adenoma in Women*, 340 NEW ENG. J. MED. 169, 169 (1999) (reporting a study that followed over 80,000 female nurses for sixteen years and found that consumption of dietary fiber was not strongly associated with a reduced risk for either colon cancer or polyps). See generally Tim Byers, *Diet, Colorectal Adenomas, and Colorectal Cancer*, 342 NEW ENG. J. MED. 1206 (2000); Yikyung Park et al., *Dietary Fiber Intake and Risk of Colorectal Cancer: A Pooled Analysis of Prospective Cohort Studies*, 294 JAMA 2849 (2005); Arthur Schatzkin et al., *Lack of Effect of Low-Fat, High-Fiber Cereal Supplement on the Recurrence of Colorectal Adenomas*, 342 NEW ENG. J. MED. 1149 (2000). The issue remains controversial, however, as some studies continue to show that a high-fiber intake is associated with a reduced risk of colon cancer. See generally Sheila A. Bingham et al., *Dietary Fibre in Food and Protection Against Colorectal Cancer in the European Prospective Investigation into Cancer and Nutrition (EPIC): An Observational Study*, 361 LANCET 1496 (2003); Ulrike Peters et al., *Dietary Fibre and Colorectal Adenoma in a Colorectal Cancer Early Detection Programme*, 361 LANCET 1491 (2003).

125. John P.A. Ioannidis, *Contradicted and Initially Stronger Effects in Highly Cited Clinical Research*, 294 JAMA 218, 218 (2005); John P. A. Ioannidis, *Why Most Published Research Findings Are False*, 2 PLoS MED. 696, 696 (2005), available at http://medicine.plosjournals.org/archive/1549-676/2/8/pdf/10.1371_journal.pmed.0020124-L.pdf.

126. The breast implant litigation provides a perfect example of multi-billion dollar litigation that never had any sound underlying scientific basis. See Bernstein, *supra* note 76, at 463.

The concerns noted above suggest that courts should simply apply Rule 702 strictly—and exclude unreliable plaintiffs’ evidence in toxic tort cases—without consulting a panel of neutral experts to confirm the rectitude of the decision.¹²⁷ Indeed, *Daubert* and amended Rule 702 disclaim a reliance on the consensus of the scientific community in favor of the reliability test.¹²⁸

On the other hand, one can argue that if Rule 702 supposes that courts are expected to “do better” than the scientific community itself is able to do, then Rule 702 is an ass.¹²⁹ If Rule 702 cannot reasonably be interpreted to allow judges to admit testimony that is consistent with “unreliable” but “best they can do” scientific opinion, it should be amended, as it is no longer serving the function of combating adversarial bias, but rather attempting to substantively raise the burden of persuasion facing the proffering party.¹³⁰

Two caveats: first, courts should only consider appointing neutral experts to review causation theories and take “educated guesses” when the issue at hand has not been the subject of significant scientific inquiry. If the only evidence potentially supporting the plaintiff’s theory of causation is

127. See generally Neal C. Stout & Peter A. Valberg, *Bayes’ Law, Sequential Uncertainties, and Evidence of Causation in Toxic Tort Cases*, 38 U. MICH. J.L. REFORM 781, 782 (2005). Stout and Valberg

attempt[] to provide a framework that helps the gatekeeper to screen out toxic tort claims insufficiently substantiated by the underlying scientific and medical data, and allow the factfinder to decide only those toxic tort claims for which there is reliable and relevant scientific support for each link of the causal chain, from subject exposure to the injury.

Id. at 781.

128. *Daubert* and the Rule 702 Advisory Committee’s note, however, do suggest that general acceptance is a factor that may be considered with respect to reliability.

129. This is an allusion to the famous line of a character from Dickens, “If the law supposes that, the law is a ass—a idiot. If that’s the eye of law, the law’s a bachelor; and the worst I wish the law is, that his eye may be opened by experience—by experience.” CHARLES DICKENS, *OLIVER TWIST* 402 (Modern Library ed., Random House 2001) (1838); cf. 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, 963 (2003). Cohen notes:

Daubert gatekeeping creates too great a risk that this sort of testimony—accurate as to facts, helpful as to probabilistic analysis, and with implicit value judgments in the choice of significance levels so easily illuminated by cross-examination that there is no need to protect the factfinders by exclusion of the testimony—will nonetheless be excluded.

Id.

Professor Cohen’s concerns can be met without opening the door to junk science if courts focus on ensuring that expert testimony is not partisan. Absent concerns of partisanship and the attendant biases, “value judgments” become a legitimate subject of debate among scientists, rather than being convenient mechanisms of ensuring that testimony meets a partisan litigant’s needs.

130. See Risinger, *supra* note 75, § 2.16, at 107–09 (arguing that standards for the admissibility of expert testimony must take into account the epistemologic environment in which experts in the field arrive at the conclusions).

speculative, and the defendant has contrary “hard data,” the court should simply exclude the plaintiff’s evidence and dismiss the case.¹³¹ Second, because plaintiffs have both the burden of production and the burden of proof, any expert whose testimony informs the court that there is not sufficient evidence to come to any meaningful conclusions, even speculative ones, about causation must be counted against a consensus in favor of the plaintiff’s perspective.

Finally, using court-appointed “neutral” experts is easier said than done. Who pays for these experts? How are they selected? How can one ensure that the judge’s own biases do not unduly influence the selection of these experts? Can a system be developed that will not substantially add to plaintiffs’ litigation costs, thus potentially discouraging the pursuit of valid claims? These are all legitimate questions that are not addressed in this Article. There is a vast literature discussing these issues and presenting various proposals.¹³² Suffice it to say, first, that courts have a wide range of options regarding how to use neutral experts, ranging from using them as advisors on admissibility issues¹³³ to having them testify instead of or in addition to adversarial experts. Second, judges who have chosen to appoint experts have managed to overcome the problems mentioned above and are generally very satisfied with the results.¹³⁴

131. For example, in the Bendectin litigation, by the late 1980s the defendant had dozens of epidemiological studies supporting the position that Bendectin did not cause the plaintiffs’ birth defects, while the plaintiffs, at best, had experts willing to speculate regarding causation. *See, e.g., Richardson v. Richardson-Merrell, Inc.*, 857 F.2d 823, 829–32 (D.C. Cir. 1988) (recounting these developments). The author puts “hard data” in quotes because it is logically impossible to prove a negative, e.g., that Bendectin does not cause birth defects. Thus, the “hardest” data that a defendant can present is that studies have shown no evidence of an effect, e.g., no evidence that Bendectin causes birth defects. The author thanks Professor Cranor for suggesting this point.

132. *See generally* Joe S. Cecil & Thomas E. Willging, *Accepting Daubert’s Invitation: Defining a Role for Court-Appointed Experts in Assessing Scientific Validity*, 43 EMORY L.J. 995 (1994); Ellen E. Deason, *Court-Appointed Expert Witnesses: Scientific Positivism Meets Bias and Deference*, 77 OR. L. REV. 59 (1998); Richard A. Epstein, *A New Regime for Expert Witnesses*, 26 VAL. U. L. REV. 757 (1992); Richard A. Epstein, *Judicial Control over Expert Testimony: Of Deference and Education*, 87 NW. U. L. REV. 1156 (1993); David L. Faigman, *Making the Law Safe for Science: A Proposed Rule for the Admission of Expert Testimony*, 35 WASHBURN L.J. 401 (1996); Carl B. Meyer, *Science and Law: The Quest for the Neutral Expert Witness: A View from the Trenches*, 12 J. NAT. RESOURCES & ENVT. L. 35 (1997); Note, *Improving Judicial Gatekeeping: Technical Advisors and Scientific Evidence*, 110 HARV. L. REV. 941 (1997); Lawrence S. Pinsky, Comment, *The Use of Scientific Peer Review and Colloquia to Assist Judges in the Admissibility Gatekeeping Mandated by Daubert*, 34 HOUS. L. REV. 527 (1997); Karen Butler Reisinger, Note, *Court-Appointed Expert Panels: A Comparison of Two Models*, 32 IND. L. REV. 225 (1998).

133. *See* Howard M. Erichson, *Mass Tort Litigation and Inquisitorial Justice*, 87 GEO. L.J. 1983, 1994 (1999) (“[C]ourts often use their own scientific experts not to testify to a jury, but rather to advise the court on such matters as the admissibility of other scientific evidence.”).

134. *See* Cecil & Willging, *supra* note 132, at 1004–19 (describing surveys and interviews with federal judges regarding their use of, and attitudes toward, court-appointed experts). *See generally* THOMAS W. WILLGING ET. AL., FED. JUDICIAL CTR., SPECIAL MASTERS’ INCIDENCE AND

IV. CONNOISSEUR TESTIMONY

A great deal of expert testimony in American courts is based solely on an expert's experience and training, which this Article refers to as connoisseur testimony. The most significant feature of connoisseur testimony is that it has no *objective* basis, and, given selection bias, its underlying reliability in any given case is therefore completely opaque. Unless a connoisseur is intentionally lying, cross-examination is unlikely to reveal any flaws in the expert's testimony.

For example, the Sixth Circuit discussed a hypothetical beekeeper who seeks to testify that bees always take off into the wind based on his many years of experience.¹³⁵ A cross-examination of such an expert would go something like this:

Q. What is the basis for your opinion that bees always take off into the wind?

A. In my twenty years of experience as a beekeeper, I've seen tens of thousands of bees take off, and it's always into the wind.

Q. Did you keep any sort of record of these sightings?

A. Nope.

Q. So the only basis we have for your conclusion is to take your word for it given your experience as a beekeeper?

A. That's right, but if you've seen as many bees as I have, always taking off the exact same way, you wouldn't have any doubt.

Connoisseur testimony includes a wide range of expertise, such as perfume sniffers, who can distinguish subtle differences among scents by sniffing them;¹³⁶ wine tasters;¹³⁷ individuals who claim to be able to tell, via smoking and appearance, the difference between Colombian seed marijuana grown in Colombia and Colombian seed marijuana grown in Florida;¹³⁸ chicken sexers who can determine the sex of a chicken from experience but cannot articulate the rationale for their conclusions;¹³⁹

ACTIVITY 8–9 (2000) (finding that judges and litigants are satisfied with the performance of special masters).

135. *Berry v. City of Detroit*, 25 F.3d 1342, 1350 (6th Cir. 1994).

136. This example was used in *Kumho Tire. Kumho Tire Co., Ltd. v. Carmichael*, 526 U.S. 137, 151 (1999).

137. *Mut. Trading Co., Inc. v. United States*, 57 Cust. Ct. 318, 325 (1st Div. 1966) (“Thus a wine taster, it is said, can tell by taste the year of a wine and the vineyard from which it comes.”).

138. *See United States v. Johnson*, 575 F.2d 1347, 1360–62 (5th Cir. 1978) (holding that the trial court properly admitted expert testimony from such an individual).

139. *See Ronald J. Allen, Expertise and the Supreme Court: What Is the Problem?*, 34 SETON HALL L. REV. 1, 9 (2003) (discussing chicken sexers).

individuals who claim to be able to distinguish between the “moo” of a sedate cow and the “moo” of a distressed cow;¹⁴⁰ and at least some document examiners.¹⁴¹ More controversially, psychiatric diagnoses based primarily on training and experience come within the connoisseurship category.¹⁴²

Much “forensic science” testimony is actually connoisseur testimony disguised as science. If one asks (as this author has)¹⁴³ fingerprint experts, forensic anthropologists, polygraph examiners, and many other forensic “scientists” what basis the jury ultimately has to trust their testimony, the answer is that the jury must rely on their training and years of experience. Consider the testimony of a forensic anthropologist who explains why he believes that a particular mark on a bone is an animal bite mark rather than a knife wound. His conclusion ultimately may depend on a “judgment call” based on his years of training and experience, rather than on some objective, verifiable standard.¹⁴⁴

Despite adopting a reliability test for all expert testimony, the third case in the *Daubert* trilogy, *Kumho Tire*, contained dicta that seemed to encourage lower courts to admit connoisseur testimony that has no provable reliable basis.¹⁴⁵ For example, the Court observed that “[e]ngineering testimony rests upon scientific foundations, the reliability of which will be at issue in some cases. . . . In other cases, the relevant reliability concerns may focus upon personal knowledge or experience.”¹⁴⁶ The Court added that “it will at times be useful to ask even of a witness whose expertise is based purely on experience, say, a perfume tester able to distinguish among 140 odors at a sniff, whether his preparation is of a kind that others in the field would recognize as acceptable.”¹⁴⁷

140. An anecdote regarding such testimony was recounted to the author by Mara Merlino, a post-doctoral research fellow at the Grant Sawyer Center for Justice Studies, University of Nevada, Reno.

141. Lynn C. Hartfield, *Daubert/Kumho Challenges to Handwriting Analysis*, CHAMPION, Nov. 2002, at 24, 24 (noting that some document examiners base their opinions solely on their training and experience).

142. For a discussion of related issues, see generally David E. Bernstein, *The Science of Forensic Psychiatry and Psychology*, 2 PSYCHIATRY, PSYCHOL. & L. 75 (1995) (proposing two theories that would distinguish scientific from non-scientific evidence).

143. The author teaches a course on expert evidence and commonly invites local forensic experts to serve as guest lecturers.

144. This precise hypothetical came up in the author’s expert-evidence class. A forensic-anthropologist guest lecturer explained how he attempts to distinguish between damage to a bone from an animal’s bite and damage from a knife wound. When the author asked him whether he could defend his conclusions via an objective standard, he replied along the lines of, “No, the jury would have to trust my judgment based on my years of experience in doing this.”

145. Robert J. Goodwin, *The Hidden Significance of Kumho Tire Co. v. Carmichael: A Compass for Problems of Definition and Procedure Created by Daubert v. Merrell Dow Pharmaceuticals, Inc.*, 52 BAYLOR L. REV. 603, 634 (2000).

146. *Kumho Tire Co., Ltd. v. Carmichael*, 526 U.S. 137, 150 (1999).

147. *Id.* at 151.

While the Court did not ban lower courts from considering additional, stricter factors, the Court's dicta suggested that it did not believe that *Kumho Tire's* reliability test created much of a barrier for connoisseur testimony.¹⁴⁸ The language of Rule 702, however, is stricter than this interpretation of *Kumho Tire's* dicta. Recall that Rule 702 requires that an expert base his testimony on "sufficient facts or data," that the "testimony is the product of reliable principles and methods," and that the expert "apply the principles and methods reliably to the facts of the case."¹⁴⁹ This language is consistent with a very plausible interpretation of *Kumho Tire*—that the Court intended to give lower courts the discretion to decide the most *appropriate type* of reliability test to use for a given piece of evidence, not the discretion to use a more "liberal" test.¹⁵⁰ Justice Scalia, concurring in *Kumho Tire* on behalf of three Justices, wrote: "The discretion [the Court] endorses—trial-court discretion in choosing the manner of testing expert reliability—is not discretion to abandon the gatekeeping function. I think it worth adding that it is not discretion to perform the function inadequately. Rather, it is discretion to choose among *reasonable* means"¹⁵¹

The Advisory Committee's note to Rule 702 cautions, "Nothing in this amendment is intended to suggest that experience alone . . . may not provide a sufficient foundation for expert testimony. . . . In certain fields, experience is the predominant, if not sole, basis for a great deal of reliable expert testimony."¹⁵² However, as David Crump points out, "Judges and lawyers can be forgiven . . . if they focus upon the language of the Rule, which is positive law."¹⁵³ Moreover, "[t]he Rule text, of course, overrides the Advisory Committee's note."¹⁵⁴

In any event, even the Advisory Committee's note's language is not very permissive. It requires that a witness who "is relying solely or primarily on experience . . . must explain how that experience leads to the conclusion reached, why that experience is a sufficient basis for the opinion, and how that experience is reliably applied to the facts."¹⁵⁵ Also, "[t]he more subjective and controversial the expert's inquiry, the more likely the testimony should be excluded as unreliable."¹⁵⁶ Most connoisseurs cannot explain how their "experience is reliably applied to the facts" in any given

148. *Id.* at 148–52.

149. FED. R. EVID. 702.

150. See D. Michael Risinger, *Defining the "Task at Hand": Non-Science Forensic Science After Kumho Tire Co. v. Carmichael*, 57 WASH. & LEE L. REV. 767, 773–77 (2000).

151. *Kumho Tire*, 526 U.S. at 158–59 (Scalia, J., concurring).

152. FED. R. EVID. 702 advisory committee's note.

153. David Crump, *The Trouble with Daubert-Kumho: Reconsidering the Supreme Court's Philosophy of Science*, 68 MO. L. REV. 1, 16 (2003).

154. *Id.*

155. FED. R. EVID. 702 advisory committee's note.

156. *Id.*

case; instead, they implicitly need the presiding judge to simply take their word for it. Rule 702 and its Advisory Committee's note, however, forbid a judge to do so.

Enforcement of Rule 702's reliability requirement for connoisseur testimony involves three steps. The first is to determine whether *anyone* can do what the expert purports to be able to do.¹⁵⁷ One might doubt, for example, whether anyone can reliably, by sight, distinguish marijuana grown in Colombia from marijuana grown in Florida when both are grown from Colombian seeds.¹⁵⁸

Second, just because the field of expertise is legitimate does not mean that the expert in question is competent. Even if *some* experts can distinguish the moo of a distressed cow from the moo of a content cow, that does not mean the specific individual proffered to the court as a cow-moo expert has that ability. There are at least three ways a court can ensure that an expert can reliably do what she claims to be able to do.¹⁵⁹ First, the court can require the expert to prove her ability. For example, a *voir dire* could be held during which an expert witness who claims to be able to distinguish between Colombian- and American-grown Colombian seed marijuana would be required to correctly distinguish among various samples of marijuana grown in different locations. Second, if a private company hires someone to perform the task at issue, that should create at least a presumption that the expert is competent. For example, if L'Oreal hires a perfume sniffer to

157. See David L. Faigman, *Embracing the Darkness: Logerquist v. McVey and the Doctrine of Ignorance of Science Is an Excuse*, 33 ARIZ. ST. L.J. 87, 91 (2001) (making a similar point and proposing that the standard focus more on "indicators of good scientific methods").

158. See *United States v. Johnson*, 575 F.2d 1347, 1360–62 (5th Cir. 1978) (allowing such testimony). In that case, the conviction of the defendants for importing marijuana hinged on the expert testimony of one of their former co-conspirators that the marijuana in question was grown in Colombia, not the United States. *Id.* at 1360. This "expert" had no direct knowledge of whether the marijuana was imported or domestic, but claimed that as a longtime marijuana dealer and smoker, he was able to distinguish not only between Colombian-seed and American-seed marijuana, but also between Colombian-seed marijuana grown in the United States and Colombian-seed marijuana grown in Colombia. *Id.* The defense presented expert testimony by a botanist that the expert's claimed skill was impossible, but the court allowed the witness to testify, and the Fifth Circuit upheld the decision. *Id.* at 1362.

The court in that case failed to ensure that the field of expertise was legitimate, failed to ensure that the particular expert could do what he claimed, and ignored an especially egregious case of selection bias. Not only did the government have its choice of purported marijuana "experts" to testify, it chose a co-conspirator who had an extremely important self-interest in supporting the government's case: the avoidance of jail time in return for providing useful testimony to the prosecution.

159. See *United States v. Santiago*, 199 F. Supp. 2d 101, 112 (S.D.N.Y. 2002) (stating that before the court would admit evidence by a proffered expert about a match between a bullet and a gun, it needed to know how often the expert's "identifications have been wrong in the past").

distinguish scents, one can presume that she is able to do this reliably.¹⁶⁰ Finally, the expert can present the results of reliable proficiency tests she has completed.

The third and most problematic issue faced by courts charged with enforcing Rule 702 is the requirement that an expert relies on “sufficient facts or data” and “appl[ies] the principles and methods reliably to the facts of the case.”¹⁶¹ Given that connoisseur experts inherently rely on their training and experience, they are incapable of presenting any “facts or data” to the court or showing the court how they reliably applied any principle or method to the facts of the case. To illustrate, Professor David Crump suggests a hypothetical dialogue with a perfume-sniffing expert based on the Rule 702 standard:

Q: Mr. Perfume Sniffer, the Supreme Court says that I must first ask you whether (1) your testimony identifying perfumes by the nasal method is based upon “sufficient facts or data.”

A: Well, I sniffed the perfume. Is that “sufficient facts or data?”

Q: And (2) I have to ask you whether your testimony is the product of “reliable principles and methods.”

A: Look. I smelled Chanel No. 5. I know I smelled Chanel No. 5.

Q: And did you “apply the principles and methods reliably to the facts of the case?”

A: I used my nose. That’s all I can do.¹⁶²

One might question, as Professor Crump does, why Rule 702 seems to exclude this expert’s testimony. Indeed, if the expert was an objective, nonpartisan witness and had passed the first two hurdles discussed above, the testimony would logically meet any reasonable reliability test. But, adversarial bias among expert witnesses prevents courts from presuming that a connoisseur’s testimony is reliable.¹⁶³

160. According to some scholars, the “commercial marketplace” test was originally the main test for the admissibility of expert testimony: “if a person could make a living selling his knowledge in the marketplace, then presumably expertise existed.” David L. Faigman et al., *Check Your Crystal Ball at the Door, Please: Exploring the Past, Understanding the Present, and Worrying About the Future of Scientific Evidence*, 15 CARDOZO L. REV. 1799, 1804 (1994). According to this theory, the *Frye* general acceptance test was created to supplement this test in the forensic science context where there was no commercial marketplace. *Id.* at 1806. For criticism of this thesis, see KAYE ET AL., *supra* note 1, at 156–57 & n.15.

161. FED. R. EVID. 702.

162. Crump, *supra* note 153, at 15.

163. *Cf.* Allen, *supra* note 139, at 10 (“My present view is that a person who cannot explain the basis of testimony in an accessible fashion or explain how it can be verified ought not be allowed to testify.”).

For example, assume that the issue in the case is whether a particular perfume was Chanel No. 5 or Giorgio. Further, assume that the plaintiff wants to argue that it was Chanel No. 5, but the first three perfume sniffers he consults are certain that it is Giorgio. At this point, the attorney could look for a hired-gun perfume sniffer who is willing to lie about the scent, or the attorney could keep surveying perfume sniffers until he finds someone who legitimately believes that the scent is Chanel No. 5. Given enough experts and the laws of probability, an attorney could almost always find one or more experience-based experts who are outliers on the relevant issue. Meanwhile, the defendant will more easily find an expert willing to testify that the perfume was Giorgio.

Assuming that both experts have appropriate training and experience (and did whatever perfume sniffers normally do before sniffing the perfume), there is no plausible way to cross-examine such experts effectively. Not only would the testimony of these experts not meet the standards of Rule 702, but also it is hard to see how a swearing contest between two or more experts, each relying on his own experience without any objective way for the trier of fact to determine who is right, even meets the basic requirement that expert testimony be helpful to the jury.

This is why “taking an expert’s word for it” with regard to connoisseur testimony is contrary to the mandates of Rule 702 and something that has properly been rejected by several courts since 2000.¹⁶⁴ Indeed, the Rule 702 Advisory Committee note explicitly states that with regard to experience-based testimony, “[a] trial court’s gatekeeping function requires more than simply taking the expert’s word for it.”¹⁶⁵ As Professor Robert Goodwin explains:

Personal knowledge and experience, of course, are factors that *qualify* one to be a witness; they are not external reliability factors that measure the reliability of the expert’s *opinion* in a particular case. If a trial court can find a non-scientific expert’s opinion reliable based upon the expert’s credentials and qualifications without testing the opinion against an external reliability factor,

164. See *Thomas v. City of Chattanooga*, 398 F.3d 426, 432 (6th Cir. 2005) (holding that a court may not rely on experience-based expert testimony if the expert cannot explain how his “experience leads to [his] conclusion,” and the court would simply have to “tak[e] the expert’s word for it” (quoting FED. R. EVID. 702 advisory committee’s note)); *United States v. Frazier*, 387 F.3d 1244, 1265 (11th Cir. 2004) (“[T]he court’s gatekeeping function requires more than simply ‘taking the expert’s word for it.’” (quoting FED. R. EVID. 702 advisory committee’s note)); *Lynn v. Amoco Oil Co.*, 459 F. Supp. 2d 1175, 1191–92 (M.D. Ala. 2006) (rejecting experience-based expert testimony because it would require “taking the expert’s word for it” (quoting FED. R. EVID. 702 advisory committee’s note)).

165. FED. R. EVID. 702 advisory committee’s note.

then the expert testimony comes perilously close to being admissible based upon the *ipse dixit* of the expert.¹⁶⁶

Thus, although scholars, such as Crump,¹⁶⁷ criticize Rule 702 for creating a standard impossible for connoisseur experts to meet, the standard is, in fact, an appropriate one. There is no way for a court to ascertain whether the proffered expert has applied his experience reliably to the facts of the case or whether the expert is a hired gun or an outlier. Nor is there any way the jury, faced with two or more connoisseur experts with similar credentials, each purporting to rely on his experience, can distinguish between the mainstream expert and the outlier, given that there is no objective criteria by which one can judge a connoisseur's opinion.

Not surprisingly, many courts have not fully assimilated Rule 702's requirements into their assessment of connoisseur testimony. The Rule requires an extremely dramatic shift from the previous practice of routinely allowing qualified connoisseurs to testify to essentially banning all testimony by adversarial connoisseur experts. Eventually, however, the text of the rule will prevail over courts' inertia, and courts will increasingly exclude connoisseur testimony.¹⁶⁸

166. Goodwin, *supra* note 145, at 635.

167. See Crump, *supra* note 153, at 15–16.

168. Courts will likely continue to be relatively liberal about admitting connoisseur testimony by police officers directly involved in the investigation and arrest of a defendant. Such experts are not “hired guns” whose testimony is available at a price (though they may suffer from conscious bias in the sense of wanting to obtain a conviction), and they are not subject to selection bias. The unconscious bias of wanting to help the prosecution team is still present, which is certainly an important consideration, but the fact remains that adversarial bias will be less of a factor in this context than in contexts in which attorneys get to choose their experts.

Courts have been especially liberal about permitting police officers to testify as “connoisseurs” about the behavior of drug dealers, in part for this reason and in part because there is little alternative but to allow investigating officers to testify if one wants to take advantage of legitimate police expertise. See Mark Hansen, *Dr. Cop on the Stand*, A.B.A. J., May 2002, at 31, 31 (discussing criticism of courts for being too willing to admit police testimony); Joëlle Anne Moreno, *What Happens When Dirty Harry Becomes an (Expert) Witness for the Prosecution?*, 79 TUL. L. REV. 1, 4–9 (2004) (asserting that judges “readily accept” testimony from police officers about “code words” used by drug dealers, coded conversations about drugs, and the modus operandi of drug dealers). For the latter reason, the problems attendant to police testimony may be intractable, as it would often be impossible to replace the police expert with a nonpartisan expert or experts.

But courts certainly could be more diligent regarding the underlying reliability of such testimony beyond the issue of adversarial bias. For example, it makes little sense to allow a police officer to testify that Post-it notes are specifically a drug “distributor’s way of being organized.” *United States v. Maher*, 454 F.3d 13, 24 (1st Cir. 2006). The *Maher* court incorrectly admitted this testimony as lay opinion testimony under Rule 701, which allowed it to avoid dealing with the fact that there is no plausible basis for concluding that drug dealers, as opposed to anyone else, are especially inclined to rely on Post-its to get organized. See Posting of David Bernstein to The Volokh Conspiracy, For Evidence Junkies—Rule 701 versus Rule 702, http://volokh.com/archives/archive_2006_08_06-2006_08_12.shtml#1155001367 (Aug. 7,

Yet to the extent that expert perfume sniffers, chicken sexers, cow-moo experts, and other similar experts can provide reliable, useful information to the jury, completely banning their testimony is foolish.¹⁶⁹ The solution to selection bias is not to ban the relevant expertise from the courtroom, but either to replace adversarial experts with nonpartisan experts chosen by the court, or to check the reliability of the experts' conclusions by surveying a panel of nonpartisan experts to ensure the general acceptance of their conclusions. For example, in the Chanel–Giorgio hypothetical, if the court were to appoint five expert perfume sniffers, four of whom conclude that the scent is Giorgio, the court could then handle things in at least two different ways. First, and perhaps most wisely, it could simply exclude the adversarial expert who claimed that the scent was Chanel on the grounds that the testimony is not reliable (as shown by the conclusions of “neutral” experts), but allow the pro-Giorgio expert to testify. Second, the court could exclude both sides' experts and allow only the court-appointed experts to testify.

Either way, the jury would receive far more useful, reliable information than it would from having a battle of the experts, none of whose testimony would be vulnerable to objective challenge. Given statistical chance, appointing a panel of neutral experts will inevitably result in outliers occasionally dominating the panel. Overall, however, the distortions from an occasional outlier-dominated panel will be much fewer than the distortions caused by routine reliance on adversarial experts.

A more difficult issue is what to do if the court appoints five experts, for example, and they split three to two on the relevant issue. In such a case, the court could appoint additional experts in the hope that they would establish

2006, 21:42). See generally D. Michael Risinger, *The Irrelevance, and Central Relevance, of the Boundary Between Science and Non-Science in the Evaluation of Expert Witness Reliability*, 52 VILL. L. REV. 679 (2007) (making a similar point and noting that police testimony, for example, “can easily slide from education to unjustified adjudicative fact assertion, morphing subtly from ‘more than an ounce is rarely bought for personal use’ through ‘more than an ounce is a sale amount’ to ‘the amount in this case was a sale amount’”).

Also, police connoisseur testimony should not be admitted if there is contradictory objective evidence that would call the reliability and objectivity of the testimony into severe doubt. Cf. *United States v. Jordan*, 236 F.3d 953, 955–56 (8th Cir. 2001) (holding admissible an expert witness's testimony regarding the distribution of black tar heroin based on the expert's knowledge, experience, and training as an undercover narcotics detective, despite inconsistencies between the agent's testimony and Drug Enforcement Administration literature).

169. Thus, if a connoisseur is simply being asked to repeat in court a conclusion he reached before being asked to testify, the expert's testimony should be presumed reliable. For example, assume that a local cowboy heard the neighbor's cow mooing in distress one evening, and the next day the cow turned up missing. The local sheriff interviewed the cowboy, who explained that he heard the cow mooing in distress. If another neighbor is charged with stealing the cow, the prosecutor should be permitted to bring the cowboy to testify that he heard the cow mooing in distress, so long as the court is persuaded that the cowboy actually has the ability to distinguish among moos.

more of a consensus, allow both sides to present their testimony, allow no testimony on the relevant issue because no reliable opinion exists, or, perhaps most simply, ask all five experts to testify and allow the jury to decide the issue with an instruction to keep burdens of proof in mind. The lattermost course will not necessarily result in an accurate verdict, but courts simply cannot be accurate in every case when even legitimate experts on an issue disagree by a close margin.

This Article will not suggest how courts should go about finding and paying for nonpartisan experts. Instead, the reader is referred to the vast law review literature on the subject.¹⁷⁰ One difference between connoisseur and toxic tort experts, however, is that courts may often be able to persuade opposing parties to agree on a joint, nonpartisan slate of connoisseur experts. Unlike in fields such as economics or toxicology, among perfume sniffers, wine tasters, art experts, and other connoisseurs, there will rarely be significant relevant methodological disputes.

V. CONCLUSION

This Article raised two questions that have been surprisingly missing from the voluminous law review literature on *Daubert* and its progeny. First, what is the underlying rationale for replacing the old, qualifications-only, let-it-all-in standard for expert testimony with Rule 702's requirement that all expert testimony be subject to a stringent reliability test? Second, once we have identified this rationale, has the "*Daubert* revolution" succeeded on its own terms?

The implicit rationale for the reliability test is to preserve the perceived advantages of the adversarial system while mitigating the harms to the courts' truth-seeking function by the inevitable and strong biases that accompany adversarial expert testimony. These biases include the conscious biases of hired guns, the unconscious biases of other paid experts, and the selection biases that result from the fact that attorneys "shop" for their experts from a large pool of qualified individuals.

Rule 702 thus attempts to serve a worthy goal, but it far from fully succeeds in efficiently achieving this goal. First, in the context of forensic expertise in criminal cases, Rule 702 does nothing to address the huge resource gaps between the prosecution and most defendants that severely inhibit defendants' ability to challenge unreliable prosecution expert testimony.

Second, Rule 702, applied correctly, does succeed in barring "junk science" causation evidence in toxic tort cases. However, it does so at the expense of excluding speculative evidence supporting causation, even when most experts in the field would conclude that the relevant evidence is a sufficient basis from which to find causation by a preponderance of the

170. See *supra* note 132 (listing several useful sources).

evidence. While Rule 702 is easily preferable to the prior overly permissive regime, it likely goes too far in insisting on a reliability test that is stricter about causation evidence than is the scientific community itself. The way around this problem is to amend Rule 702 to allow courts to admit educated guesses about causation, but only when nonpartisan experts not subject to adversarial bias are willing to make such guesses.

Finally, Rule 702 places severe restrictions on experience-based testimony by connoisseurs. Such experts may testify only if their field of expertise is a legitimate one and if they have proven to the court that they truly have the expertise they claim. Rule 702 also properly prevents attorneys from shopping for outlier and hired-gun connoisseurs, given that there is no objective way for a jury to determine whether an experience-based expert's views are correct or representative of other experts in the field. Therefore, in the context of connoisseur testimony, courts should either replace adversarial experts with a panel of nonpartisan experts or only allow an adversarial expert to testify if his conclusions are consistent with those of a nonpartisan advisory panel.

The problem with the *Daubert* revolution, then, is not that it was too radical, but that it was not radical enough. Rule 702 attempts to solve the problem of adversarial bias through a reliability test, but it leaves intact the general adversarial structure that creates the underlying reliability problem. In the context of forensic expert testimony, this means that Rule 702 has little effect on the provision of unreliable testimony by prosecutors. In the contexts of speculative causation testimony in toxic tort cases and connoisseur testimony, Rule 702 solves the problem of adversarial bias, but only by practically banning any such testimony, even though such testimony would be very helpful to the jury when it would reflect a consensus of nonpartisan experts.

In short, Rule 702 continues and indeed amplifies the wrong turn taken by the *Daubert* trilogy in insisting that judges attempt to discern the underlying reliability of proffered expert testimony in a given case. *Daubert* and Rule 702 should instead have focused on whether the testimony reflects unbiased, nonpartisan opinion within the expert witness's legitimate field of expertise. Such a focus would inevitably require a hard, skeptical look at accepted verities about the current system's reliance on partisan, adversarial experts.