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# BLINDED BY SCIENCE: HOW JUDGES AVOID THE SCIENCE IN SCIENTIFIC EVIDENCE

*Erica Beecher-Monas\**

## INTRODUCTION

Quite a hullabaloo has greeted the United States Supreme Court's 1993 evidentiary ruling in *Daubert v. Merrell Dow Pharmaceuticals, Inc.*<sup>1</sup> The Supreme Court's instruction that judges must inquire into the scientific validity of proposed expert testimony<sup>2</sup> garnered both kudos<sup>3</sup> and criticism.<sup>4</sup> The consternation of Judge Kozinski, on remand, was palpable when he called the task of evaluating scientific testimony "a far more complex and daunting task in a post-*Daubert* world than before."<sup>5</sup> Far from backing down, however, the Supreme Court since has reiterated its gatekeeping requirement in *General Electric Co. v. Joiner*.<sup>6</sup>

By requiring judges to evaluate the science in scientific evidence, *Daubert*, and its reiteration in *Joiner*, makes judges responsible for the validity of the evidence in their courtrooms. Requiring judges to act as evidentiary gatekeepers, analyzing proffered testimony for the soundness of its underlying theory, its technique and application, and analyzing that testimony in light of the issues posed by the case,<sup>7</sup> does not seem like an insurmountable judicial task. After all, judges are supposed to direct legal

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1. 509 U.S. 579 (1993).

2. *Id.* at 596-97.

3. The United States Congress was so taken with the opinion that the House of Representatives endorsed a bill (currently before the Senate) amending the Federal Rules of Evidence by codifying *Daubert*. H.R. 988, 104th Cong., 1st Sess. (1995); see also Edward W. Kirsch, *Daubert v. Merrell Dow Pharmaceuticals, Inc.: Active Judicial Scrutiny of Scientific Evidence*, 50 FOOD & DRUG L.J. 213, 213 (1995) (explaining why "the *Daubert* standard represents a significant improvement over the *Frye* test").

4. Chief Justice Rehnquist was prominent among the judges raising an outcry about the impossibility of the gatekeeping role assigned judges by the majority, arguing in dissent that the majority was forcing judges "to become amateur scientists to perform [their] role." *Daubert*, 509 U.S. at 601 (Rehnquist, J., dissenting).

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

6. 118 S. Ct. 512 (1997). Notably, the majority opinion in *Joiner* was written by Chief Justice Rehnquist, perhaps indicating a more optimistic assessment of the capabilities of federal judges to perform their gatekeeping functions.

7. *Daubert*, 509 U.S. at 596-97.

proceedings based on logical analysis and considered judgment.<sup>8</sup> Many judges, however, are avoiding the scientific component, particularly in criminal cases.

As the first ruling on scientific evidence by the Supreme Court since the Federal Rules of Evidence were promulgated in 1975, *Daubert* cannot be ignored. Moreover, *Daubert's* requirement that judges actually think about the validity of the evidence before them is a vast improvement over merely deferring to the experts and hoping the jury can sort out the charlatans from the pundits.<sup>9</sup> Rather than taking the *Daubert* mandate seriously and re-examining the basis of proffered evidence, however, many courts continue to admit evidence that cannot be justified scientifically.<sup>10</sup> These courts admit evidence that could not meet the *Daubert* criteria on a number of other basis: either as "technical," and thus nonscientific, or as time-honored, and therefore subject to judicial notice.

The problem in criminal evidence is that hair identification, bitemark analysis, voice spectrography, handwriting analysis, and even such time-honored prosecutorial tools of identification as fingerprinting, have crept into court with virtually no demonstration of their scientific bases.<sup>11</sup> Each of

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8. See Ronald J. Allen, *Rationality, Mythology, and the "Acceptability of Verdicts" Thesis*, 66 B.U. L. REV. 541, 561-62 (1986) (stating the judicial system "should continue to strive for rationality" rather than depart from reality as we are able to reconstruct it).

9. For seventy years, all that was required for scientific evidence to be admissible was that it be generally accepted in the relevant scientific field. See *Frye v. United States*, 293 F. 1013, 1014 (D.C. Cir. 1923). As noted *infra* notes 25-30 and accompanying text, the result was that judges were able to avoid accountability for an important category of evidence being admitted in their courts.

10. A strict *Daubert* analysis poses a major challenge for all but a small percentage of forensic evidence in criminal cases. See, e.g., John L. Thornton, *Courts of Law v. Courts of Science: A Forensic Scientist's Reaction to Daubert*, 1 SHEPARD'S EXPERT & SCI. EVIDENCE Q. 475, 482 (1994) (noting that much of forensic science has "precious little scientific foundation" and "does not comport with the classical definition of a science"). *Daubert* was a civil toxic tort action; the current approach of the courts, however, is to apply *Daubert* in both the civil and the criminal contexts. *Developments in the Law, Confronting the New Challenges of Scientific Evidence*, 108 HARV. L. REV. 1481, 1529 (1995) [hereinafter *Confronting the New Challenges*]. Apart from DNA identification techniques, which originated for other than forensic uses and therefore were subjected to rigorous scientific scrutiny as they developed, the problem for forensic evidence is its questionable scientific foundation. See Randolph N. Jonakait, *Forensic Science: The Need for Regulation*, 4 HARV. J.L. & TECH. 109, 133-34 (1991) (observing that most forensic science is not endorsed by general scientific community, its procedures have undergone little controlled testing, and its error rates are either undetermined or preposterously high); Michael J. Saks & Jonathan J. Koehler, *What DNA "Fingerprinting" Can Teach the Law About the Rest of Forensic Science*, 13 CARDOZO L. REV. 361, 362 (1991) (noting that "more is known about the strengths and weaknesses of DNA fingerprinting evidence than about most of the other, older, and more widely used forms of forensic science evidence"); Thornton, *supra*, at 482 (noting that "[a] number of tests—e.g., handwriting comparison, hair identification—have marked empirical validity but precious little scientific foundation because they are so subjective and, furthermore, do not comport with the classical definition of a science").

11. See *Suggs v. State*, 907 S.W.2d 124, 126 (Ark. 1995) (finding hair sample admissible although expert admitted on cross-examination that "the scientific field cannot prove the hair came from a certain individual to the exclusion of any other person"); Margaret A. Berger,

these identification techniques is based on the theory that fingerprints, voice patterns, bitemarks, etc., are uniquely personal.<sup>12</sup> This is a theory based on faith (and—in the case of fingerprints, at least—some experience<sup>13</sup>), not on the rigorous testing expected of scientific disciplines or required to meet the *Daubert* standards of admissibility.<sup>14</sup>

The thesis of this article is that requiring judges to examine the logic behind scientific evidence presents the opportunity for causing major, beneficial changes in the evidence offered in criminal cases. Evaluating the basis of scientific evidence is not an insurmountable task. Those jurisdictions taking *Daubert* seriously and re-examining forensic evidence have disallowed, as unable to meet the threshold of scientific validity, such time-honored identification techniques as hair and voiceprints. Some techniques, such as polygraphs, that long have been denied admissibility as unreliable, are begin-

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*Procedural Paradigms for Applying the Daubert Test*, 78 MINN. L. REV. 1345, 1354-55 (1994) (observing that some of most venerable branches of forensic evidence have never demonstrated their ability to make unique identifications).

12. See, e.g., Michelle McClure, Comment, *Odontology: Bite Marks as Evidence in Criminal Trials*, 11 SANTA CLARA COMPUTER & HIGH TECH. L.J. 269, 270 (1995) (discussing debate over whether each individual possesses a unique dentition and bite mark).

13. Note, however, that although it is popular belief that no two fingerprints are alike, there have been no systematic controlled studies to prove it. Moreover, fingerprint identification techniques are far from infallible. See, e.g., *State v. Caldwell*, 322 N.W.2d 574, 587 (Minn. 1982) (mandating new trial because fingerprint expert's testimony later was discovered to be wrong); Andre A. Moenssens, *Novel Scientific Evidence in Criminal Cases: Some Words of Caution*, 84 J. CRIM. L. & CRIMINOLOGY 1, 12 (1993) (stating that "[m]isidentifications have even occurred in disciplines as old and widely used as fingerprint identification"); George Bonebreak, *Fabricating Fingerprint Evidence*, IDENTIFICATION NEWS, Oct. 1976, at 3 (describing fifteen cases of fabricated fingerprint evidence).

14. Indeed, where courts have addressed the admissibility of such forensic evidence under the *Daubert* standard, they have had to admit it could not pass the admissibility threshold and have had to find other avenues to find it admissible. See, e.g., *United States v. Starzeczyzel*, 880 F. Supp. 1027, 1046-47 (S.D.N.Y. 1995) (finding that although handwriting analysis could not meet *Daubert* standards, it was nonetheless admissible as nonscience that would be helpful to jury). Notably, many forensic techniques have made their way into the courtroom under the general acceptance test, only to be discarded subsequently. See Margaret A. Berger, *Evidentiary Framework*, in THE FEDERAL JUDICIAL CENTER'S REFERENCE MANUAL ON SCIENTIFIC EVIDENCE 75 (1995) (noting that general acceptance by a small number of experts in a given field allowed in the now-discredited techniques of voiceprint analysis and paraffin testing for gunpowder residue, among others). As one commentator explained,

[M]ost of the forensic identification sciences cannot begin to meet the new *Daubert* criterion by which they will be tested, although they easily passed the old *Frye* standard. Identification science consists largely of speculation, impression, and intuition. It is a field of assertedly scientific endeavor that, ironically, cannot offer sufficient research data in its own behalf simply because its basic theoretical notions have been subjected to virtually no empirical testing.

Michael J. Saks, *Implications of the Daubert Test for Forensic Identification Science*, 1 SHEPARD'S EXPERT & SCI. EVIDENCE Q. 427 (1994). This factor has been widely recognized in other common law countries, such as Great Britain, Australia, and Canada, and is engendering a widespread debate over the perceived misuse of scientific evidence in criminal cases. See David E. Bernstein, *Junk Science in the United States and the Commonwealth*, 21 YALE J. INT'L L. 123, 174 (1996) (discussing criticism resulting from misuse of "junk science").

ning to find their way into court via *Daubert*.<sup>15</sup> Admission of psychological testimony for the defense is also more frequent than in the past.<sup>16</sup> Other methodologies, such as DNA testing, that were formerly the exclusive province of the prosecution, are now being introduced to demonstrate innocence, meeting the *Daubert* criteria, and resulting in the release and acquittal of wrongly accused or convicted defendants.<sup>17</sup> Outside the courtroom, the recent investigation and critique of the FBI's forensic laboratories is an example of beneficial changes feasible when *Daubert* is taken seriously.<sup>18</sup>

*Daubert* requires litigants and judges to focus on the interaction of theory and methodology in a way that should change not only the way evidence must be justified, but the soundness of the evidence itself.<sup>19</sup> All too often, however, courts continue to evade the science issues. In far too many jurisdictions, judges are turning a blind eye to the science involved in the evidence before them. Ignoring *Daubert* is a travesty in criminal trials where the presumption of innocence is fundamental.

## I. *DAUBERT* AND ITS GENESIS

### A. Admissibility of Expert Testimony Pre-*Daubert*

*Daubert* emerged against the backdrop of immense public controversy over the perceived flood of "junk science" that, according to some popular critics, threatened to inundate the courts.<sup>20</sup> For years, *Frye v. United States*<sup>21</sup>

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15. See, e.g., *United States v. Posado*, 57 F.3d 428, 434 (5th Cir. 1995) (holding polygraph evidence is no longer per se inadmissible after *Daubert*); *Ulmer v. State Farm Fire & Cas. Co.*, 897 F. Supp. 299, 303 (W.D. La. 1995) (finding polygraph tests of insureds admissible in jury trial on insurance claims); *United States v. Crumby*, 895 F. Supp. 1354, 1361 (D. Ariz. 1995) (finding polygraph evidence sufficiently reliable under *Daubert* to permit defendant to offer it as evidence at trial). But see *United States v. Black*, 831 F. Supp. 120, 123 (E.D.N.Y. 1993) (finding *Daubert* did not alter settled rule that polygraph evidence was inadmissible).

16. See *United States v. Hall*, 93 F.3d 1337, 1342-43 (7th Cir. 1996) (remanding for reconsideration of whether psychiatric and social psychology testimony could qualify under *Daubert*); *United States v. Shay*, 57 F.3d 126, 132 (1st Cir. 1995) (finding it was erroneous to exclude psychiatric testimony); *United States v. Norwood*, 939 F. Supp. 1132, 1134-35 (D.N.J. 1996) (stating that testimony regarding reliability of eyewitness identification admissible).

17. A recently released report examines the exoneration and release of twenty-eight wrongly convicted defendants—some of whom had been sentenced to death—through DNA evidence. EDWARD CONNERS ET AL., CONVICTED BY JURIES, EXONERATED BY SCIENCE: CASE STUDIES IN THE USE OF DNA EVIDENCE TO ESTABLISH INNOCENCE (1996).

18. Although the immediate cause of the Department of Justice investigation of the FBI laboratories was the whistleblowing of Frederic Whitehurst, the thoroughness of the investigation and the resulting recommended overhaul of the laboratories was, in large part, a response to what the Department perceived as the mandate of *Daubert* to justify the scientific validity of forensic evidence. See, e.g., UNITED STATES DEPARTMENT OF JUSTICE OFFICE OF INSPECTOR GENERAL, FBI LABS REPORT 9 (May 30, 1997) [hereinafter FBI LABS REPORT] (acknowledging significant impact of *Daubert* on the way forensic evidence must be analyzed and presented).

19. See, e.g., *id.* (acknowledging significant impact of *Daubert* on the way forensic evidence must be analyzed and presented).

20. The term "junk science" was popularized by Peter Huber, who defined it as "jargon-filled, serious-sounding deception." PETER W. HUBER, GALILEO'S REVENGE: JUNK SCIENCE IN THE COURTROOM 2, 3 (1991). Toxic tort cases, involving allegations of injury resulting from

was the predominant standard for the admissibility of scientific evidence.<sup>22</sup> *Frye* was a murder case involving expert testimony based on an early version of the polygraph technique, which the court found inadmissible because polygraph testing had not achieved general acceptance in the relevant scientific community.<sup>23</sup> The *Frye* test asked whether the proffered evidence—including the conclusions reached—was generally accepted in a relevant community of experts.<sup>24</sup> *Frye* thus offered a standard of admissibility based on the general acceptance of the proposed testimony by a relevant community of experts, and permitted peer review and publication to substitute for any attempt at analysis by the court.

Although a majority of courts applied the general acceptance standard, its results were anything but uniform. Some courts applying the general acceptance test did little more than “count noses,”<sup>25</sup> while others performed in-

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exposure to chemicals, were the primary focus of Mr. Huber’s ire. An often-cited example is *Wells v. Ortho Pharmaceutical Corp.*, 788 F.2d 741 (11th Cir. 1986), in which the court permitted testimony that spermicide caused birth defects and based its decision on the credibility of the expert rather than the scientific validity of the testimony. *Id.* at 744-45. For an article detailing the momentum for reform of the admissibility requirements for scientific evidence, see Paul C. Giannelli, “Junk Science”: *The Criminal Cases*, 84 J. CRIM. L. & CRIMINOLOGY 105, 107-08 (1993).

21. 293 F. 1013 (D.C. Cir. 1923).

22. A majority of courts at the time the Supreme Court granted certiorari in *Daubert*—including the district court in *Daubert*—followed the general acceptance test first articulated in *Frye v. United States*, 293 F. 1013 (D.C. Cir. 1923). The *Frye* Court explained that “while courts will go a long way in admitting expert testimony deduced from a well-recognized scientific principle or discovery, the thing from which the deduction is made must be sufficiently established to have gained general acceptance in the particular field in which it belongs.” *Id.* at 1014. Even after promulgation of the Federal Rules of Evidence, the general acceptance test continued to be the majority standard. A notable exception was the Second Circuit, which rejected *Frye* in *United States v. Williams*, 583 F.2d 1194, 1197-99 (2d Cir. 1978) (assessing reliability by examining acceptance among scientists who had used the technique, relevant error rate, protocol standards, and the expert’s application of the technique), *cert. denied*, 439 U.S. 1117 (1979). Arkansas rejected the *Frye* standard in 1991, favoring a more analytic approach. *See Prater v. State*, 820 S.W.2d 429, 433 (Ark. 1991) (requiring proponent of evidence to make preliminary showing of reliability and opponent to attack reliability on cross-examination at preliminary hearing). California adopted a variation of the *Frye* test, which required the additional demonstration that the correct scientific procedures were used in the particular case. *See People v. Kelly*, 549 P.2d 1240, 1244 (Cal. 1976). In 1989, New York adopted a similar requirement. *See People v. Castro*, 545 N.Y.S.2d 985, 987 (1989). Some courts, including the Eighth Circuit, subsequently focused on the reliability of the evidence, and required the court to hear testimony from experts on both sides regarding the matter. *See United States v. Two Bulls*, 918 F.2d 56, 61 (8th Cir. 1990); *Ex parte Perry*, 586 So. 2d 242, 248 (Ala. 1991); *People v. Lindsey*, 868 P.2d 1085, 1090-91 (Colo. Ct. App. 1993); *Commonwealth v. Rodgers*, 605 A.2d 1228, 1234 (Pa. Super. Ct. 1992). Others courts rejected this requirement. *See State v. Cauthron*, 846 P.2d 502, 505 n.2 (Wash. 1993) (stating *Frye* test is more conservative approach because court is less likely to admit evidence still disputed in scientific community).

23. *Frye*, 293 F. at 1014.

24. *Id.*

25. *See Williams*, 583 F.2d at 1198 (admitting spectrographic voice analysis testimony despite its lack of general acceptance because it found scientific validity cannot rest solely on a process of counting scientific noses); *see also United States v. Ferri*, 778 F.2d 985, 991 (3d Cir.

depth analyses.<sup>26</sup> In practice, the apparently straightforward standard provoked a number of controversies.

For one, it frequently was unclear which facets of the testimony or underlying rationale must be generally accepted.<sup>27</sup> For another, the *Frye* standard failed to account for the phenomenon that much knowledge slips into general acceptance without any careful examination, especially where that knowledge has been accepted for a long time.<sup>28</sup> Most controversial of all, however, was the *Frye* test's substitution of peer review and publication for any detailed analysis by the court. In effect, this permitted nonjudicial actors to make what is essentially a judicial policy decision and deflected responsibility away from the judge.<sup>29</sup>

Consequently, at a time when scientific evidence was becoming increasingly important in resolving legal disputes, the standards for its courtroom use were anything but certain.<sup>30</sup> Not surprisingly, criticism of the legal system's ability to cope with scientific evidence mounted.<sup>31</sup> Among the various solutions proposed were separate science courts,<sup>32</sup> special administrative

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1985) (excluding testimony as to footprint identification because general acceptance was neither a necessary nor sufficient condition for admissibility); Paul C. Giannelli, *The Admissibility of Novel Scientific Evidence: Frye v. United States a Half-Century Later*, 80 COLUM. L. REV. 1197, 1209-11 (1980) (discussing difficulties in applying *Frye* test); Barry C. Scheck, *DNA and Daubert*, 15 CARDOZO L. REV. 1959, 1959 (1994) (discussing fact that under *Frye* test judges merely "count noses").

26. The opinion in *In re Agent Orange Product Liability Litigation*, 611 F. Supp. 1223 (E.D.N.Y. 1985), provides an excellent example of in-depth analysis under the *Frye* test. *Cf. Confronting the New Challenges*, *supra* note 10, at 1494-95 (noting the demonstrable doctrinal indeterminacy illustrated by the fact that "*Frye* courts have come out both ways" on the same type of evidence).

27. Andre A. Moenssens, *Admissibility of Scientific Evidence—An Alternative to the Frye Rule*, 25 WM. & MARY L. REV. 545, 553 (1984) (giving examples).

28. David L. Faigman et al., *Check Your Crystal Ball at the Courthouse Door, Please: Exploring the Past, Understanding the Present, and Worrying about the Future of Scientific Evidence*, 15 CARDOZO L. REV. 1799, 1811 & n.37 (1994) (citing Philip H. Abelson, *The Need for Skepticism*, 138 SCI. 75 (1962)).

29. David L. Faigman, *Making the Law Safe for Science: A Proposed Rule for the Admissibility of Expert Testimony*, 35 WASHBURN L.J. 401, 405 (1996) (observing that "greatest defect of the general acceptance test was that it allowed judges to abdicate responsibility for understanding science well enough to integrate it into the law").

30. Jennifer Laser, *Inconsistent Gatekeeping in Federal Courts: Application of Daubert v. Merrell Dow Pharmaceuticals, Inc. To Nonscientific Expert Testimony*, 30 LOY. L.A. L. REV. 1379, 1379 (1997) (observing that with an increasing reliance on expert testimony, the standards for admissibility became a matter of great debate).

31. *See, e.g.*, HUBER, *supra* note 20, at 216-28 (arguing that judges should scrutinize substance of scientific testimony before admitting it). Huber's expose itself came under attack as a form of junk science because it was based on anecdotal rather than survey evidence. *See* Kenneth J. Chesebro, *Galileo's Retort: Peter Huber's Junk Scholarship*, 42 AM. U. L. REV. 1637, 1652 (1993) (rejecting Huber's work as factually incorrect and product of faulty legal analysis).

32. *See, e.g.*, Arthur Kantrowitz, *Proposal for an Institution for Scientific Judgment*, 156 SCI. 763, 764 (proposing science court to solve problem of judicial inability to handle scientific testimony).

tribunals,<sup>33</sup> and an interdisciplinary council established to advise the courts.<sup>34</sup> It was against this background that the Supreme Court granted certiorari in *Daubert*.

### B. The *Daubert* Analysis

*Daubert v. Merrell Dow Pharmaceuticals, Inc.*<sup>35</sup> was a civil case involving claims that Bendectin, a morning-sickness remedy which the plaintiffs' mothers had taken during pregnancy, had caused plaintiffs' limb-reduction birth defects.<sup>36</sup> The evidence at issue consisted of epidemiological re-analyses, in which data obtained in previously published studies was re-analyzed and proffered to support plaintiffs' claims. The trial court found the plaintiffs' proffer insufficient to withstand defendants' motion for summary judgment, because it did not meet with general acceptance in the field to which it belongs.<sup>37</sup> The Ninth Circuit affirmed, holding an expert opinion inadmissible absent general acceptance of the underlying technique,<sup>38</sup> and the Supreme Court granted certiorari to resolve "the proper standard for the admission of expert testimony."<sup>39</sup>

The Supreme Court dispatched the general acceptance test in a few paragraphs, finding it an "austere standard" that was superseded by adoption of the Federal Rules of Evidence in 1975.<sup>40</sup> The Court explained that the two-pronged test of Rule 702<sup>41</sup> requires judges to assume a gatekeeping role by inquiring into the reliability of the evidence and the helpfulness of the

33. See, e.g., Troyen A. Brennan, *Causal Chains and Statistical Links: The Role of Scientific Uncertainty in Hazardous-Substance Litigation*, 73 CORNELL L. REV. 469, 523-32 (1988) (proposing administrative mechanism for handling toxic tort litigation).

34. See, e.g., CARNEGIE COMMISSION ON SCIENCE, TECHNOLOGY & GOVERNMENT, SCIENCE AND TECHNOLOGY IN JUDICIAL DECISION MAKING: CREATING OPPORTUNITIES AND MEETING CHALLENGES 49 (1993) (proposing interdisciplinary science council to advise the courts).

35. 509 U.S. 579 (1993).

36. *Id.* at 582-83.

37. *Id.* at 583.

38. *Daubert v. Merrell Dow Pharms., Inc.*, 951 F.2d 1128 (9th Cir. 1991), *vacated*, 509 U.S. 579 (1993).

39. *Daubert*, 509 U.S. at 585.

40. *Id.* at 589. Calling the *Frye* general acceptance test an austere standard is somewhat surprising, considering the widespread criticism of the courts for permitting far too much "junk science" to come into evidence, as exemplified by HUBER, *supra* note 20. It is also something of an anomaly that the rigorous analysis mandated by the Court would be far more austere in effect than the general acceptance standard, which let in anything that could command a consensus among a group of specialists. See *supra* notes 11-18 and accompanying text. Nonetheless, use of the term "austere" gives credence to the notion that the Supreme Court was widening rather than closing the gate to scientific evidence. On the other hand, as Judge Kozinski was quick to note on remand, the rigorous analysis required by the Supreme Court would close the gate to much of the expert testimony in criminal cases. *Daubert v. Merrell Dow Pharms., Inc.*, 43 F.3d 1311, 1317 & n.5 (9th Cir. 1995). This fear was picked up by Congress in its proposed bill, H.R. 988, which would have codified *Daubert* as a rule of evidence, but which exempted criminal evidence from its scope. H.R. 988, 104th Cong., 1st Sess. (1995).

41. Rule 702 provides: "If scientific, technical, or other specialized knowledge will assist the trier of fact to understand the evidence or to determine a fact in issue, a witness qualified as an



evidence to the jury.<sup>42</sup> This requires the trial judge to conduct an independent inquiry into the scientific validity, scientific reliability, and relevance of the proposed testimony.<sup>43</sup>

The Court defined reliability in the scientific context as scientific validity, which the majority linked to the expert's adherence to scientific method.<sup>44</sup> To determine scientific validity, the trial judge must examine both the logic underlying the expert's methodology and the application of the methodology in the particular case.<sup>45</sup> The Court distinguished evidentiary reliability, which in the context of scientific evidence it defined as scientific "validity," from scientific "reliability" (the ability to produce consistent results by means of the scientific method).<sup>46</sup> That is, the Court recognized that a flawed test based on a faulty hypothesis may produce consistent, replicable results (and therefore be scientifically reliable) without being either scientifically valid or reliable as evidence.<sup>47</sup>

The first prong of the Court's analysis thus requires judges to critique scientific evidence and separate the wheat of valid scientific methodology from the chaff of chicanery.<sup>48</sup> In satisfying the reliability portion of the test, the proponent must establish, by a preponderance of the proof,<sup>49</sup> that "the reasoning or methodology underlying the testimony is scientifically valid and . . . that reasoning or methodology properly can be applied to the facts in issue."<sup>50</sup> The second prong is a relevance inquiry, that asks whether there is a "valid scientific connection [of the underlying principles and methodology] to the pertinent inquiry."<sup>51</sup>

According to the Supreme Court, the judge must be able to examine the logic behind the expert's proffered testimony without taking sides on its outcome.<sup>52</sup> Not the expert's conclusions, but the principles and methodology underlying the proposed testimony are to be the object of judicial scrutiny.<sup>53</sup>

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expert by knowledge, skill, experience, training, or education, may testify thereto in the form of an opinion or otherwise." FED. R. EVID. 702.

42. *Daubert*, 509 U.S. at 590-92.

43. *Id.* at 597.

44. *Id.* at 590.

45. *Id.* at 580.

46. *Id.* at 590 n.9.

47. A cogent example is given in *Confronting the New Challenges*, *supra* note 10, at 1534: "a new test for blood alcohol level may be invalid in that it grossly underestimates the amount of alcohol in one's bloodstream, and yet may be reliable in that it underestimates the blood alcohol level in one's bloodstream by the same amount every time."

48. *Daubert*, 509 U.S. at 592-93.

49. *Id.* at 592 & n.10.

50. *Id.* at 592-93.

51. *Id.* at 592. This second requirement, which the Court referred to as "fit", was the subject of further elaboration in *Joiner*, where the Court addressed the admissibility of epidemiological and animal studies, holding that the district court did not abuse its discretion in finding the studies too far afield to be relevant to the facts at issue. *General Elec. Co. v. Joiner*, 118 S. Ct. 512, 515 (1997).

52. *Id.* at 594.

53. *Id.*

To guide this scrutiny, the Court outlined four non-definitive factors. The trial judge should consider whether the theory can be and has been tested, its error rate, whether it has been subjected to peer review and publication, and whether it has met with general acceptance in the scientific community.<sup>54</sup>

## II. ISSUES UNRESOLVED BY *DAUBERT*

Among the issues left unresolved by the *Daubert* decision are the kinds of evidence that fall within the scope of the Court's mandated analysis, whether judges are capable of the gatekeeping task now imposed upon them, and whether *Daubert* has resulted in more or less consistent evidentiary rulings among the circuits. Other questions include whether more or less evidence will find its way into court as a result of *Daubert*, at what point in the proceedings a *Daubert* challenge may be made, and whether the state courts will elect to follow the *Daubert* analysis. The answers to these questions are still far from clear.

### A. *To What Kinds of Evidence Does Daubert Apply? The Technical vs. Scientific Debate*

District judges have no discretion to ignore *Daubert*.<sup>55</sup> Where *Daubert* applies, its framework for analysis must be used.<sup>56</sup> The question, of course, is just what kinds of evidence fall within *Daubert's* scope. The evidence at issue in *Daubert* was novel scientific testimony involving reanalyses of previously gathered epidemiologic data, offered in a toxic tort case. Unquestionably, therefore, *Daubert* applies to novel scientific evidence in federal civil cases.<sup>57</sup> But, due to the Supreme Court's equivocation about whether the *Daubert* analysis is limited to that context,<sup>58</sup> many questions remain. Must courts engage in a *Daubert* analysis for expert evidence that is not scientific, i.e., for evidence that is "merely technical"? Does it apply to scientific evidence that is not novel? Must a court apply *Daubert* in criminal cases?<sup>59</sup> Many courts

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54. *Id.* General acceptance was the standard articulated under *Frye v. United States*, 293 F. 1013, 1014 (D.C. Cir. 1923) (holding that scientific principles forming basis of expert testimony must be generally accepted in particular field).

55. *Frymire-Brinati v. KPMG Peat Marwick*, 2 F.3d 183, 186 (7th Cir. 1993) (deciding that *Daubert* demands determination of reliability of cash flow analysis).

56. *Id.*

57. *Confronting the New Challenges*, *supra* note 10, at 1498-1509.

58. The Court said only that "[a]lthough the *Frye* decision itself focused exclusively on 'novel' scientific techniques, we do not read the requirements of Rule 702 to apply specially or exclusively to unconventional evidence." *Daubert*, 509 U.S. at 592 n.11. This appears to suggest a broader application for *Daubert* analysis than novel scientific evidence. On the other hand, the Court further muddied the waters by suggesting that well established scientific theories, such as the laws of thermodynamics, are subject to judicial notice. *Id.*

59. Because the *Frye* standard, which the Court overruled, originated in a criminal case involving the admissibility of polygraph evidence, and by implication from the numerous criminal cases cited in *Daubert*, it would appear that the Court made no distinction in terms of the evidentiary analyses required in civil and criminal cases involving scientific evidence. It did not, however, directly address the issue.

consider these questions to have been left unanswered by the Supreme Court's decision and use this as an opportunity to circumvent the required analysis.<sup>60</sup>

Post-*Daubert* criminal courts have attempted to answer these questions in a number of ways. A few have used the guidelines to analyze proffered criminal evidence and have found previously acceptable evidence inadmissible.<sup>61</sup> More often, rather than engage in a full *Daubert* analysis, courts confronted with the admissibility of criminal identification evidence resort to categorizing the evidence as "technical" and therefore outside the scope of *Daubert*.<sup>62</sup> Such tactics are an unwarranted abdication of judicial responsibility.<sup>63</sup>

First, Rule 702, which the Supreme Court construed in *Daubert*, applies to the admissibility of all expert testimony.<sup>64</sup> Although the Court said its discussion was limited to scientific knowledge, because that was what was before the Court, the Court required that the proposed testimony be supported by "good grounds."<sup>65</sup> That means it must be supported by valid

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60. The Court cryptically noted that although Rule 702 applies to technical or other specialized, as well as scientific, knowledge, its discussion was limited to the scientific context by virtue of the nature of the proffered expertise. *Daubert*, 509 U.S. at 590 n.8.

61. Hair analysis, previously widely admissible, see *infra* notes 317-20 and accompanying text, failed to meet the *Daubert* standards in *Williamson v. Reynolds*, 904 F. Supp. 1529, 1559 (E.D. Okla. 1995) (finding hair comparison testing unreliable due to lack of scientific studies).

62. See *United States v. Webb*, 115 F.3d 711, 716 (9th Cir. 1997) (deciding that *Daubert* applies only to scientific, not technical or specialized, knowledge). This is not the only circumventing gambit. Others include judicial notice, or finding the evidence so overwhelmingly prejudicial when balanced against its probative value that—assuming it could pass muster under Rule 702—it is found inadmissible under Rule 403 (without the necessity of engaging in a full *Daubert* analysis). See *United States v. Kwong*, 69 F.3d 663, 668 (2d Cir. 1995) (excluding polygraph evidence because probative value of evidence substantially outweighed by confusion of issues and misleading jury); *United States v. Sherlin*, 67 F.3d 1208, 1216-17 (6th Cir. 1995) (holding polygraph results properly excluded due to unfair prejudice substantially outweighing probative value), *cert. denied*, 116 S. Ct. 795 (1996). Or courts punt the issue to the jury, finding disagreements over performance of valid protocol to go to the weight of the evidence rather than its admissibility. See *United States v. Bonds*, 12 F.3d 540, 561 (6th Cir. 1993) (holding that application goes to weight, not admissibility). *But see* *United States v. Martinez*, 3 F.3d 1191, 1198 (8th Cir. 1993) (finding failure to follow standard protocol goes to admissibility); *United States v. Coronado-Cervantes*, 912 F. Supp. 497, 500 (D.N.M. 1996) (holding that compliance with DNA procedure goes to admissibility, not weight).

63. For an article castigating courts for this "crabbed interpretation of the Court's opinion as well as a misconstruction of the principles underlying Rule 702" see David L. Faigman, *Mapping the Labyrinth of Scientific Evidence*, 46 *HASTINGS L.J.* 555, 559 (1995) (discussing ramifications of *Daubert* on judge's responsibilities and on Federal Rules of Evidence).

64. For the text of Rule 702, see *supra* note 41.

65. *Daubert v. Merrell Dow Pharms.*, 509 U.S. 579, 589-90 (1993).

methods and reasoning.<sup>66</sup> The most important mandate of *Daubert* is that judges must actively evaluate proposed expert testimony.<sup>67</sup>

Knowledge, according to the Court, “connotes more than subjective belief or unsupported speculation.”<sup>68</sup> It makes little sense to admit any expert evidence grounded in faulty logic and untested methodology. Biases, idiosyncracies, faulty logic, and all the other modes of self-deception have no more place in evidence used to determine an accused’s guilt or innocence than they do in evidence used to determine the liability of pharmaceutical companies for the birth defects of babies whose mothers ingested their products. What makes “good grounds” for technical, as well as scientific, evidence is keen observation and critical evaluation of what was observed.<sup>69</sup> There is no *a priori* rationale for encouraging self-deception in one category of evidence (the “technical”) while castigating it in another (the “scientific”).<sup>70</sup> Postulations about causation and the necessary interconnection between repeatable phenomena must be as carefully tested in criminal laboratories as in medical research, if not more so.<sup>71</sup>

Moreover, the Court must have expected judges to analyze the rationale behind technical—i.e., criminal—evidence as well as “novel” scientific methodologies, such as the epidemiology reanalyses at issue in *Daubert*. *Frye*, which the Court overruled, involved polygraph evidence.<sup>72</sup> That is precisely the kind of evidence many courts now are attempting to categorize as “technical” and therefore not subject to *Daubert*. This is highly disingenuous. The Court even referred to the evidence at issue in *Frye* as “scientific.”<sup>73</sup> To exempt purportedly accurate identification techniques from scrutiny in cases which are supposed to bear an increased burden of proof because they in-

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66. See Susan R. Poulter, *Daubert and Scientific Evidence: Assessing Evidentiary Reliability in Toxic Tort Litigation*, 1993 UTAH L. REV. 1307, 1321 (1993) (stating that because invalid reasoning or methods cannot produce probative conclusions, evidence derived from such methods is not relevant).

67. Cf. Faigman, *supra* note 63, at 555 (stating that single most important “guidepost” in *Daubert* is Court’s directive to judges to “actively evaluate” scientific evidence).

68. *Id.*

69. See Randolph N. Jonakait, *The Assessment of Expertise: Transcending Construction*, 37 SANTA CLARA L. REV. 301, 320-22 (1997) (explaining that although observing nature is not value-free, process of rigorous, critical evaluation attempts to minimize self-deception).

70. The methodology of good science is a set of rules to keep the practitioner from self-deception about the observations made about the study of natural phenomena. Theodore R. Vallance, *Social Science and Social Policy: Amoral Methodology in a Matrix of Values*, 27 AM. PSYCHOLOGIST 107, 107 (Feb. 1972).

71. Cf. Jonakait, *supra* note 69, at 320-21 & 323 n.66 (explaining that postulations about causation and necessary interconnection between repeatable phenomena demand gathering of facts: observations from nature or from deliberate perturbations of nature, called experiments).

72. *Frye* actually involved the precursor of the modern polygraph, the “systolic blood-pressure deception test.” *Frye v. United States*, 293 F. 1013, 1013 (D.C. Cir. 1923).

73. *Daubert v. Merrell Dow Pharms.*, 509 U.S. 579, 592 n.11 (1993).

volve the defendant's potential deprivation of liberty, and perhaps death, defies justice as well as logic.<sup>74</sup>

Regrettably, in a large number of jurisdictions, post-*Daubert* courts are circumventing any rigorous analysis in order to continue to admit expert testimony that is shockingly unscientific.<sup>75</sup> Not infrequently, convictions have been based on evidence for which the scientific foundation is highly suspect.<sup>76</sup> Continued admissibility in some jurisdictions of bitemark analysis, voiceprint evidence, and handwriting analysis can be accounted for only in this way, because there is virtually no empirical data on error rates for this kind of evidence, and what there is suggests that the so-called experts are wrong as often as they are right.<sup>77</sup> Admitting such evidence under the guise that it is "technical nonsense" is dishonest in the extreme. The term "technical nonsense" is technical nonsense. It is precisely the kind of technical evidence masquerading as science that *Daubert* was concerned most about.

It should be obvious by the Court's emphasis on gatekeeping that judges must admit only expert testimony that can withstand logical analysis.<sup>78</sup> It is the judge's job to distinguish between useful and misleading testimony.<sup>79</sup> Although the details of the inquiry may differ depending on the type of evidence proffered (indeed, as the Court explained, its factors are merely guidelines), all expert testimony is subject to Rule 702. Failure to examine the

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74. See Faigman, *supra* note 29, at 422 (observing that "pseudoscientists could draw the perverse conclusion from *Daubert* that the key to admission is to remain unscientific in order to avoid standards they find difficult to meet").

75. See generally David L. Faigman, *The Evidentiary Status of the Social Sciences Under Daubert: Is it "Scientific," "Technical," or "Other" Knowledge?*, 1 PSYCHOL. PUB. POL'Y & L. 960 (1995) (discussing *Daubert's* applicability to realm of psychology).

76. Forensic dentists identifying scratch marks and forensic anthropologists claiming to identify the wearer from shoe prints are egregious examples of untested pseudo-science responsible for convictions. See Marcia Coyle, *Daubert vs. Frye: "Expert" Science Under Fire in Capital Cases*, NAT'L L.J., July 11, 1994, at A1 (discussing use of forensic dentist); Mark Hansen, *Believe it or Not*, A.B.A. J., June 1993, at 64-67 (discussing forensic anthropologist identification of person from shoe print). A more celebrated example of such evidentiary travesties can be found in *Barefoot v. Estelle*, 463 U.S. 880 (1983), where the defendant was executed based on evidence of future dangerousness, evidence most responsible psychologists find to be "at the brink of quackery." Paul C. Giannelli, *Daubert: Interpreting the Federal Rules of Evidence*, 15 CARDOZO L. REV. 2021 (1994) (quoting George E. Dix, *The Death Penalty, "Dangerousness," Psychiatric Testimony, and Professional Ethics*, 5 AM. J. CRIM. L. 151, 172 (1977)).

77. D. Michael Risinger et al., *Exorcism of Ignorance as a Proxy for Rational Knowledge: The Lessons of Handwriting Identification "Expertise"*, 137 U. PA. L. REV. 731, 744-51 (1989) (detailing unpublished results of tests given by Forensic Science Foundation over several years, for which most generous reading of results showed accuracy rate of only 57%).

78. As one court explained, although the details of *Daubert* apply to scientific knowledge because that was the context of the case, its general requirements apply to all specialized knowledge. *United States v. Posado*, 57 F.3d 428, 432 (5th Cir. 1995).

79. See Jeffrey S. Parker, *Daubert's Debut: The Supreme Court, The Economics of Scientific Evidence, and the Adversarial System*, 4 SUP. CT. ECON. REV. 1, 49 (1995) (observing that "Daubert reorients admissibility doctrine more closely to what one might reasonably expect of evidence law" by requiring "an acceptable analog in expert testimony to the foundation requirement of first-hand knowledge in ordinary testimony . . . [in order] to insure that the witness has an observational advantage over the fact-finders").

logical underpinnings—and in particular, the error rates—for forensic identification techniques, would appear to undermine the presumption of innocence to which our criminal courts give lip service.

Why is this happening in the criminal courts? As noted earlier, the dilemma for the criminal courts is that much criminal identification evidence in its current state of development cannot possibly meet the *Daubert* standards.<sup>80</sup> Often there is little empirical support for the evidence. Appropriate scientific standards are widely ignored in forensic laboratories.<sup>81</sup> The recent exposure of perjury and pervasively bad laboratory practices in the FBI laboratories has forced a number of retrials and overturned convictions.<sup>82</sup> Such problems emphasize the urgency of analyzing all expert testimony with the same kind of rigor required for scientific evidence under *Daubert*. Rather than meet these problems head-on, however, and risk the wrath of prosecutors (and the public) unable to get key evidence admitted, courts are using circumventing gambits to avoid analysis that would reveal the systemic inadequacies of criminal laboratories.

### *B. Can Federal Judges Perform the Required Analysis?*

Although the “junk science” outcry is frequently ascribed to the insurance lobby incensed over increasing civil liability awards,<sup>83</sup> the most dramatic changes from a rigorous analysis may be in the criminal context. If the problem was the inability of courts to deal with scientific evidence intelligently because judges simply had no frame of reference with which to evaluate the validity of scientific knowledge, *Daubert* gave courts some flexible guidelines.<sup>84</sup> In addition, the Court declared its unreserved confidence in the ability of trial judges to make such determinations with respect to scientific evidence. Unfortunately, both the usefulness of the guidelines and the ability of judges to apply them have generated controversy.<sup>85</sup>

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80. See Saks & Koehler, *supra* note 10, at 361-62 (providing that extensive scrutiny given DNA evidence reveals lack of empirical support for most forensic evidence and noting that widely asserted assumptions that no two fingerprints, gun barrel markings, writings, or tool marks is the same, lacks empirical support).

81. The National Research Council (“NRC”) issued a report recommending stricter standards for certifying and testing forensic laboratories. NATIONAL RESEARCH COUNCIL, DNA TYPING IN FORENSIC SCIENCE (Apr. 14, 1992).

82. See generally FBI LABS REPORT, *supra* note 18 (Apr. 15, 1997) (supplying findings of investigation of FBI laboratory).

83. See Chesebro, *supra* note 31, at 1643 (noting wide support of Huber’s view on “junk science” particularly by insurance lobby).

84. See *Daubert v. Merrell Dow Pharms., Inc.*, 509 U.S. 579, 593 (1993) (providing that testability, peer review and publication, rate of error, and general acceptance are factors trial judges may consider in assessing reliability of method).

85. See, e.g., John M. Conley & David W. Peterson, *The Science of Gatekeeping: The Federal Judicial Center’s New Reference Manual on Scientific Evidence*, 74 N.C. L. REV. 1183, 1205 (1996) (noting experience of authors that federal judges “tend to be highly resistant to the sort of learning that *Daubert* demands”).

### 1. Do the Guidelines Make Sense?

The most important and controversial of the Court's guidelines were its testability and error rate factors. The remaining factors, peer review and publication, and general acceptance, are merely reiterations of the old *Frye* test and have been accepted with virtually no discussion. Many judges are resistant to the sort of analysis that *Daubert* demands.<sup>86</sup> In his *Daubert* dissent, for example, Chief Justice Rehnquist complained that he was at a loss to know what falsifiability, the Court's explanation of testability, meant.<sup>87</sup> The Center for Judicial Studies has made extensive efforts to educate judges about the scientific method.<sup>88</sup> Whether the guidelines offer adequate guidance to trial judges is therefore an important question.

Specifically, the Court directed judges to examine testability, whether the hypothesis can be and has been tested. This inquiry should encompass the adequacy of the testing method in terms of its ability to show what it is supposed to demonstrate.<sup>89</sup> In doing so, the Court recognized that the concept of genuine testability is a unique form of scientific argument.<sup>90</sup> Genuine testability in science means not only that a hypothesis can be verified or falsified by observation and experiment, but also that the hypothesis has precise logical consequences that are incompatible with alternative hypotheses.<sup>91</sup>

Testability thus means that the effects of secondary variables are either controlled or known (as in an experiment) or assumed (as in observational

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86. *Id.* at 1205-06 ("Our nearly uniform experience with hundreds of judges at every level is that they think methodology is something for academics to worry about.").

87. *Daubert*, 509 U.S. at 600 (Rehnquist, C.J., dissenting).

88. See THE FEDERAL JUDICIAL CENTER, REFERENCE MANUAL ON SCIENTIFIC EVIDENCE 1 (1997) (providing basic information about fundamental scientific protocols in order to assist judges in performing required analysis).

89. *Daubert*, 509 U.S. at 593.

90. "The goal of science is the systematic organization of knowledge about the universe on the basis of explanatory principles that are genuinely testable." Francisco J. Ayala, *Biology as an Autonomous Science*, 56 AM. SCI. 207, 207 (1968). According to Karl Popper, the distinguishing characteristic of a scientific statement is that it is capable of being falsified. KARL R. POPPER, *THE LOGIC OF SCIENTIFIC DISCOVERY* 86 (1959). Although few scientists would describe their work in terms of falsifiability of particular statements (most would call their work verifying hypotheses), it may be said that was what they were doing after the fact. See *Tests of the Truth*, *ECONOMIST*, Nov. 14, 1992, at 106 ("Few experimenters plan their work in terms of falsification of particular statements—though it is possible, after the fact, to say that that is what they have been doing. Experiments are often taken as confirmations of truth, not failures to falsify."). Falsifiability is the term defining scientific method that was picked up by the Supreme Court in explaining the concept of testability, much to the chagrin of Chief Justice Rehnquist, who, in the *Daubert* dissent, remarked that he was "at a loss to know what is meant when it is said that the scientific status of a theory depends on its 'falsifiability.'" *Daubert*, 509 U.S. at 600 (Rehnquist, C.J., dissenting).

91. Ayala, *supra* note 90, at 207. "Science advances toward truth (though never arriving at certainty) by a combination of bold conjecture and severe criticism." Thomas F. Gieryn, *Boundaries of Science*, in *HANDBOOK OF SCIENCE AND TECHNOLOGY STUDIES* 395 (Sheila Jasanoff et al. eds., 1994).

studies of human populations, for example).<sup>92</sup> In creating a control group, a researcher is permitting the chosen hypothesis to be falsified. The data may either corroborate or refute the proposed hypothesis.<sup>93</sup>

The validity of the experimental conclusion depends on: (1) whether the results demonstrate a relationship between the tested variables; (2) whether there is a causal or merely fortuitous relationship; (3) whether the hypothesized cause and effect relationship is logical in light of the experimental results; and (4) whether the relationship between the variables can be generalized to other situations.<sup>94</sup> Problems in any of these areas would undermine the study's validity. This involves sufficient inquiry into the details of a given set of experiments to determine whether the hypothesis being tested logically could be validated or falsified by the experiments in question, whether the researcher's design avoided potential sources of bias, and whether the experiments were conducted carefully and with appropriate controls so that the data accurately reflects the results of the experiment.<sup>95</sup>

The notion of testability as the *sine qua non* of scientific argument concededly has come under fire in recent years. That is because major theoretical constructs may be corroborated by observation but are not empirically testable. Evolution, for example, although widely accepted in scientific circles, is not testable.<sup>96</sup> Neither is the theory of relativity.<sup>97</sup>

Moreover, the concept of testability as the defining characteristic of science creates a dilemma for the social sciences and psychology. These fields rely predominantly on retrospective observational studies rather than on controlled experimentation, and do not necessarily meet the *Daubert* standard of falsifiability.<sup>98</sup> Although it can be said that these fields have evolved outside

92. For a descriptive distinction between experiment, quasi-experiment, and observational study, see Stephen E. Fienberg et al., *Understanding and Evaluating Statistical Evidence in Litigation*, 36 JURIMETRICS J. 1, 15-17 (1995).

93. See David L. Faigman, *To Have and Have Not: Assessing the Value of Social Science to the Law as Science and Policy*, 38 EMORY L.J. 1005, 1018 (1995) (stating "the fact that scientific theories are vulnerable to falsification imparts a strength stemming from having taken the risk of refutation").

94. THOMAS D. COOK & DONALD T. CAMPBELL, QUASI-EXPERIMENTATION: DESIGN & ANALYSIS ISSUES FOR FIELD SETTINGS 39 (1979).

95. *Id.* at 7-8 (discussing various meanings of "control" in research).

96. See, e.g., Conley & Peterson, *supra* note 85, at 1201-04 (noting fallacies in Supreme Court's reliance on testability as ultimate criteria for what makes something "scientific").

97. Rochelle Cooper Dreyfuss, *Is Science a Special Case? The Admissibility of Scientific Evidence After Daubert v. Merrell Dow*, 73 TEX. L. REV. 1779, 1785 (1995). See, e.g., STEPHEN W. HAWKING, A BRIEF HISTORY OF TIME: FROM THE BIG BANG TO BLACK HOLES 74-75 (1988) (acknowledging shortcomings of experimental testing of grand unified theories of the universe). This may be because of the lag time between the theory's promulgation and the development of technology capable of testing it. For example, not until 1995 was the technology available to demonstrate the physical consequences of Einstein's "unified field theory." See Adina Schwartz, *A "Dogma of Empiricism" Revisited: Daubert v. Merrell Dow Pharmaceuticals, Inc., and the Need to Resurrect the Philosophical Insight of Frye v. United States*, 10 HARV. J.L. & TECH. 149, 187-88 (1997) (discussing evolution of technology to test Einstein's unified field theory).

98. Indeed, Karl Popper, whom the Supreme Court cited for its concept of falsifiability, was using the concept explicitly to differentiate between "true" empirical science and what Popper



the scientific method, that does not make their insights any less valuable. It may be that a parallel set of criteria for validity must be developed for these non-empirical sciences. However, apart from testability, many of the same concerns with respect to validity, such as the use of statistics and the coherence of the underlying theory, are indicia of reliability in these fields also.

Observation and interpretation, and the fit between them, are concerns basic to scientific reasoning.<sup>99</sup> Replicability of results is only one factor in determining scientific validity. It is also crucial to determine how well (i.e., how logically) the data is analyzed.<sup>100</sup> This is why it is important to examine the methodology for formal problems of experimental design,<sup>101</sup> models of data,<sup>102</sup> and how well the data actually fit the model of the data expected from the theory.<sup>103</sup> The theory of the experiment permeates all these considerations.<sup>104</sup> Difficulties encountered at all but the level of "fit" to expected models reflect weaknesses in the experiment rather than in the fundamental theory.<sup>105</sup>

considered the pseudosciences of economics (Karl Marx was the particular target of Popper's ire) and psychology (Freud was singled out in Popper's polemic). Schwartz, *supra* note 97, at 162, 165.

99. KARIN D. KNORR-CETINA, *THE MANUFACTURE OF KNOWLEDGE: AN ESSAY ON THE CONSTRUCTIVIST AND CONTEXTUAL NATURE OF SCIENCE* 21 (1981).

100. Validity refers to the ability of a scientific test to measure what it purports to measure. *Id.*

101. The issues with respect to the model involve the number of trials and choice of experimental parameters. *Id.* A model is the formal description of "how observations are produced" incorporating various assumptions "implicit in the presentation" of the evidence. Fienberg et al., *supra* note 92, at 2.

102. Issues involving models of data include homogeneity, stationarity, fit of experimental parameters. Patrick Suppes, *Models of Data*, in *LOGIC, METHODOLOGY AND PHILOSOPHY OF SCIENCE: PROCEEDINGS OF THE 1960 INTERNATIONAL CONGRESS* 252, 256-59 (Ernest Nagel et al. eds., 1962).

103. *See id.* at 258-59 (discussing hierarchy of "theories, models, and problems").

104. *Id.* at 259.

105. *Id.* For example, a scientist assessing the validity of conclusions in a contested body of scientific work—epidemiology—describes five problem areas as: (i) a "stipulated research hypothesis;" (ii) a "well-specified cohort;" (iii) "high-quality data;" (iv) "analysis of attributable actions;" and (v) "avoidance of detection bias." Alvan R. Feinstein, *Scientific Standards in Epidemiologic Studies of the Menace of Daily Life*, 242 *SCI.* 1257, 1259-61 (1988). Cohort studies are observational studies in which one group is composed of individuals already exposed to a suspected disease-causing agent a control group composed of similar individuals who have not been exposed to the agent. Case control studies are limited to the study of a single disease, proceed by using existence of the disease as the independent variable, and utilize controls who are similar individuals who did not develop the disease. Both methodologies are subject to systematic errors. How the group is selected or diagnosed can be crucial. *See, e.g.*, David L. Sackett, *Bias in Analytic Research*, 32 *J. CHRONIC DISEASES* 51, 51 (1979) (describing numerous sources of systemic bias). Inaccurate diagnosis of the disease is one problem area in epidemiology, as is measurement of exposure. Random selection is another potential source of error. Michael D. Green, *Expert Witnesses and Sufficiency of the Evidence in Toxic Substances Litigation: the Legacy of "Agent Orange" and Bendectin Litigation*, 86 *Nw. U. L. REV.* 643, 650 (1992).

Several statistical<sup>106</sup> concepts are also important in assessing the validity of scientific conclusions. Mean,<sup>107</sup> standard deviation,<sup>108</sup> level of statistical significance,<sup>109</sup> and confidence interval<sup>110</sup> are basic concepts surfacing in literally thousands of cases.<sup>111</sup> These concerns about statistics are part of what underlies the Court's error rate factor. In addition, the error rate factor encompasses the application of the methodology in the particular case. It is important to know, especially in criminal identification tests, how often a given test gives the wrong results. Proficiency testing of the laboratory and the technician, which will reveal the rate of error for a given test, are therefore crucial for determining the test's validity.<sup>112</sup>

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106. For a concise explanation of how statistics are used in scientific evidence, and describing statistics as "the science of uncertainty, a body of methods for making inferences and decisions when faced with fallible observations or other forms of uncertainty," see Fienberg et al., *supra* note 92, at 3.

107. The mean, familiarly known as the average, is calculated by dividing the sample sum by the sample size. For an excellent analysis of statistical concepts intended for a legal audience, see generally MICHAEL O. FINKELSTEIN & BRUCE LEVIN, *STATISTICS FOR LAWYERS* 88-89 (1990) (analyzing use of hair evidence in bank robbery case).

108. Standard deviation is a calculation of the amount of variation among samples. The standard deviation is calculated by taking the square root of the variance among samples. T. COLTON, *STATISTICS IN MEDICINE* 126 (1974). The standard deviation increases as the differences in results of individual sample points become larger. *Id.*

109. The level of statistical significance describes how plausible the values are. Acceptable ranges are 5% to less than 1%. Fienberg et al., *supra* note 92, at 22. In designing an experiment to determine whether a chemical is toxic or causes cancer, for example, the researcher, in addition to proposing a hypothetical relationship between the chemical and disease, accounts for errors by using a null hypothesis—that the chemical in question has no effect—and mathematically summarizes the results that differ in the control (untreated) and test group. If chance alone could explain the results of the experiment less than 5% of the time (an arbitrarily chosen but generally accepted figure) the results of the experiment are said to be statistically significant. *Id.*

110. The complement of the level of statistical significance, confidence interval is defined as the range within which the average of a particular data point lies 95% or 99% of the time. *Id.* at 24. It is the probability that the procedure produces an interval that includes the correct value. *Id.* at 25. Scientific evidentiary standards are designed thus to minimize the occurrence of false positives. For a discussion of the appropriateness of applying the 95% confidence interval to the regulatory context and tort law, where the concern is not providing a firm foundation for future research but identifying and controlling chemicals that more probably than not cause disease, see generally RICHARD A. CRANOR, *REGULATING TOXIC SUBSTANCES: A PHILOSOPHY OF SCIENCE AND LAW* 40-48 (1993).

111. See Richard Lempert, *The New Evidence Scholarship: Analyzing the Process*, 66 B.U. L. REV. 439, 442 (1986) (noting the "dramatic growth" in legal cases involving statistical evidence).

112. Jonathan J. Koehler, *Error and Exaggeration in the Presentation of DNA Evidence at Trial*, 34 JURIMETRICS J. 21, 24 (1993) [hereinafter Koehler, *Error and Exaggeration*]. Although proficiency testing is designed to measure laboratory performance problems rather than error rates, the frequency of false results, which is revealed through proficiency testing, is precisely what the court needs to know, even if it is a by-product of the testing process rather than its goal. See Jonathan J. Koehler, *Why DNA Likelihood Ratios Should Account for Error (Even When a National Research Council Report Says They Should Not)*, 37 JURIMETRICS J. 425, 429-30 (1997) [hereinafter Koehler, *DNA Likelihood Ratios*] (explaining irrelevancy of the fact that proficiency tests do not measure error rates).

As a check on the judge's reasoning process, the Court also permitted resort to peer review and publication, and general acceptance as surrogates for the old *Frye* consensus test. These last two factors as noted above, may have little to do with the soundness of the science behind proposed testimony. Although studies that have been panned in the scientific press may indeed have flaws that a judge ought to be able to take into account, there may be many reasons for sound scientific studies to go unreviewed and unpublished; the intensely competitive nature of the scientific enterprise among them.

Thus, in elaborating its factors, the Supreme Court took into account many of the same factors—and all of the crucial ones—that scientists themselves use to assess each others' work. There is no glaring flaw with the guidelines themselves, which are explicitly not to be used as a checklist, but as a flexible framework for analysis. As the courts become more familiar with applying this framework, they should become more comfortable with assessing scientific validity of the evidence in their courtrooms. The question, of course, remains open as to whether judges are capable of learning to think like scientists.

## 2. Can Judges Learn to Think Like Scientists?

Many judges question judicial abilities to assess scientific validity. Chief Justice Rehnquist, for example, in his *Daubert* dissent, felt the majority was requiring district judges to become "amateur scientists."<sup>113</sup> Judge Kozinski, in the *Daubert* remand, was openly sarcastic about the feasibility of the effort.<sup>114</sup> There are, however, many judges who have risen amply to the occasion.<sup>115</sup> A fair number of judges were engaging in a validity analysis long before *Daubert* required it.<sup>116</sup> These judges demonstrate that judges can indeed learn to think like scientists, at least insofar as being able to recognize faulty logic when they hear it.

In the four years since *Daubert*, the results admittedly have been uneven. Judges comfortable with analyzing scientific validity before *Daubert* continue to do so.<sup>117</sup> Those judges too discomfited by the new analysis,

113. *Daubert v. Merrell Dow Pharms., Inc.*, 509 U.S. 579, 601 (1993) (Rehnquist, C.J., dissenting).

114. *Daubert v. Merrell Dow Pharms., Inc.*, 43 F.3d 1311 (9th Cir.), *cert. denied*, 116 S. Ct. 189 (1995).

115. *See, e.g., In re Paoli R.R. Yard PCB Litig.*, 35 F.3d 717, 763-65 (3d Cir. 1994) (Becker, J. holding Dr. DiGregorio's medical testimony inadmissible because he failed to examine patients and thus lacked necessary foundation to testify and using *Daubert* to hold Dr. Sherman's testimony admissible for limited purpose).

116. *See, e.g., In re "Agent Orange" Prod. Liab. Litig.*, 611 F. Supp. 1223 (E.D.N.Y. 1985) (Weinstein, J.) (granting chemical companies' motion for summary judgment because plaintiffs failed to present valid expert testimony showing causal link between exposure to Agent Orange and veterans' diseases), *aff'd*, 818 F.2d 187 (2d Cir. 1987) (Winter, J.).

117. For example, Judge Becker of the Third Circuit Court of Appeals employed a validity test for admitting scientific evidence in *United States v. Downing*, 753 F.2d 1224 (3d Cir. 1985) (cited by the Supreme Court in *Daubert*), as well as in *In re Paoli R.R. Yard*, 35 F.3d at 763-65.

however, are finding ways to circumvent it. Some of the avoidance techniques include the erection of barriers by insisting the evidence meet requirements that have little to do with its inherent logic. For example, in the *Daubert* remand, Judge Kozinski added an unwarranted new admissibility factor that he found to trump those listed by the Supreme Court: whether the research was conducted independent of the litigation.<sup>118</sup> Even Judge Kozinski recognized the problematic nature of his new factor for criminal evidence,<sup>119</sup> where most of the research involved is generated only for litigation.<sup>120</sup> There is virtually no other “market” for identification tests.

Heavy emphasis on the general acceptance factor without engaging in a thorough analysis of the other factors, a kind of back-door endorsement of *Frye*, also permits courts to evade accountability.<sup>121</sup> Another popular circumventing gambit for avoiding the in-depth scrutiny required by *Daubert* is taking judicial notice of previously admissible testimony without new analysis.<sup>122</sup> This sort of “grandfathering in” of evidence that otherwise might not meet the *Daubert* standards was a tactic taken by the Eighth Circuit when it took judicial notice of the general validity of DNA identification techniques based on the findings of a Second Circuit case.<sup>123</sup> In doing so, it managed to evade grappling with validity issues, and merely rubber-stamped another court’s perhaps faulty analysis.

In the civil context, the Second Circuit’s reinstatement of geological evidence that the district court had rejected under *Daubert* provides a novel twist.<sup>124</sup> The Second Circuit explained that such evidence was not scientific

See *United States v. Shonubi*, 895 F. Supp. 460, 498-524 (E.D.N.Y. 1995) (analyzing the use of statistics in sentencing a drug courier); In re *Agent Orange*, 611 F. Supp. at 1244-45.

118. *Daubert*, 43 F.3d at 1317. This new factor was unwarranted because it had nothing to do with any logical analysis of the proffered evidence. See Conley & Peterson, *supra* note 85, at 1197 (arguing that nothing in text of *Daubert* justified approach Ninth Circuit took).

119. *Daubert*, 43 F.3d at 1317 n.5.

120. See also H.R. 988, 104th Cong., 1st Sess. (1995) (exempting criminal evidence from the proposed *Daubert* codification).

121. See, e.g., *Officer v. Teledyne Republic/Sprague*, 870 F. Supp. 408, 410 (D. Mass. 1994) (“*Daubert*’s principles . . . have less use in fields like design engineering where ‘general acceptance’ is the norm, not the exception.”).

122. See, e.g., *United States v. Martinez*, 3 F.3d 1191, 1197 (8th Cir. 1993) (holding validity of DNA testing can be judicially noticed); *Williamson v. Reynolds*, 904 F. Supp. 1529, 1557-58 (E.D. Okla. 1995) (holding expert hair testimony invalid for failing to reach valid level of certainty); *Hein v. Merck & Co.*, 868 F. Supp. 230, 235 (M.D. Tenn. 1994) (taking judicial notice of invalidity of hedonic damages); *United States v. Black*, 831 F. Supp. 120, 123 (E.D.N.Y. 1993) (holding polygraph evidence unreliable). The *Daubert* court recognized this as a viable option for those branches of science that were well established. *Daubert v. Merrell Dow Pharms., Inc.*, 509 U.S. 579, 598 (1993). Whether or not DNA profiling is such a well-established branch, the danger, of course, is that one or two jurisdictions will determine the admissibility of a given category of evidence and others simply will ride their coattails, turning the old general acceptance test on its head by making it acceptance by other courts rather than other scientists.

123. *Martinez*, 3 F.3d at 1197 (concluding that taking judicial notice of the validity determination regarding DNA “fingerprinting” in a pre-*Daubert* case, *United States v. Jakobetz*, 955 F.2d 786 (2d Cir. 1992), is still valid after *Daubert*).

124. *Iacobelli Constr., Inc. v. County of Monroe*, 32 F.3d 19, 25 (2d Cir. 1994).

at all and therefore not subject to *Daubert* analysis. It was merely "methodology and data typically used and accepted in construction-litigation cases."<sup>125</sup> This sounds suspiciously like a return to the old general acceptance standard, with a twist: the court seems to be relying on acceptance by the courts rather than other experts.<sup>126</sup> This permits the court to avoid the required independent inquiry, with unfortunate results for accountability.<sup>127</sup>

As discussed above, some jurisdictions do an end-run around the logical analysis requirements of *Daubert* by categorizing certain types of expert evidence as nonscientific.<sup>128</sup> Although the ostensible difference between *Frye* and *Daubert* is that it is now explicitly the judge who acts as gatekeeper, rather than the scientific community,<sup>129</sup> it is unclear whether the practical

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125. *Id.* So much for Judge Kozinski's idea that research designed expressly for litigation should be excluded! See *supra* notes 114, 118-20 and accompanying text.

126. Notably, this circumventing gambit is not limited to avoidance of the *Daubert* analysis. Courts under the *Frye* rule used it too. The admissibility of bite mark evidence is instructive in this regard. The earliest bite mark cases perfunctorily admitted the evidence without any discussion of general acceptance. See *People v. Johnson*, 289 N.E.2d 722, 726 (Ill. App. Ct. 1972); *Doyle v. State*, 263 S.W.2d 779, 780 (Tex. Crim. App. 1954). Even courts acknowledging that bite mark evidence could not meet the general acceptance test found the evidence admissible as verifiable by the court and based on "scientifically and professionally established techniques." *People v. Marx*, 126 Cal. Rptr. 350, 356 (Ct. App. 1975). Later courts, rather than address the dilemma, simply took judicial notice of previous courts' determinations of admissibility. *People v. Milone*, 356 N.E.2d 1350, 1359 (Ill. App. Ct. 1976) (citing *Doyle*, *Patterson* and *Marx*). After the murder conviction in *Milone* was affirmed, the Seventh Circuit denied a petition for habeas relief based on the unreliability of the bite mark evidence used to convict him, because it found the probative value of the state's evidence was not so greatly outweighed by its prejudice to the defendant that its admission denied him a fundamentally fair trial. *Milone v. Camp*, 22 F.3d 693, 702 (7th Cir. 1994); see also *State v. Richards*, 804 P.2d 109, 112 (Ariz. App. 1990) (admitting bite mark evidence without any preliminary determination of reliability); *People v. Middleton*, 429 N.E.2d 100, 104 (N.Y. 1981) (relying on judicial notice of bite mark admissibility and disclaiming necessity of separately establishing scientific reliability in each case). In this way, bite mark evidence found its way into widespread use in criminal prosecutions without ever having to demonstrate any empirical basis for its underlying tenet that teeth can make recognizable marks that are uniquely identifiable to a particular individual. See Steven Weigler, *Bite Mark Evidence: Forensic Odontology and the Law*, 2 HEALTH MATRIX 303, 306 (1992) (stating that teeth can make recognizable marks usable in identifications). In the only case requiring forensic odontologists to demonstrate the empirical basis for their assertions, the experts were unable to identify which of sixteen models of teeth had created the bite marks in question because all the models could be made to match the contours of the marks. *Kris Sperry & Homer R. Campbell, Jr., D.D.S., An Elliptical Incised Wound of the Breast Misinterpreted as a Bite Injury*, 35 J. FORENSIC SCI. 1226, 1231 (1990).

127. The Tenth Circuit, for example, took judicial notice of the "stringent *Martinez* standard" of the Eighth Circuit for DNA evidence—a standard which itself relied on judicial notice of a Second Circuit case—without attempting any assessment of possible errors in execution, although *Martinez* required such an assessment. *United States v. Davis*, 40 F.3d 1069, 1074-75 (10th Cir. 1994), *cert. denied*, 115 S. Ct. 1806 (1995).

128. See, e.g., *United States v. Jones*, 107 F.3d 1147, 1157 (6th Cir. 1997) (acknowledging that "lack of empirical evidence in the field of handwriting analysis" precluded admissibility under *Daubert*, but nonetheless admitting it as specialized knowledge helpful to jury).

129. See *United States v. Bonds*, 12 F.3d 540, 555-56 (6th Cir. 1993) (explaining that judge must now decide not only whether others in expert's field find reasoning sound, but also whether reasoning really is sound within framework of scientific method).

consequence of this difference will mean that cases will be decided differently using the *Daubert* analysis than they were under *Frye*. Some skeptics contend that *Frye* and *Daubert* essentially are indeterminate and cannot account for the results in particular cases.<sup>130</sup>

None of this means that judges are incapable of performing the required analysis. What it does suggest, however, is a continued need for appellate supervision and increased judicial education. The clear trend is toward more informed judicial rulings, despite some backsliding.<sup>131</sup> Moreover, the necessity of articulating the basis for evidentiary decision making on scientific issues at least forces judges to focus more explicitly on whether the proffered evidence will be helpful.<sup>132</sup> Requiring judges to examine the underlying rationale for proffered evidence, its accuracy, and connecting it with the matters under investigation does not seem to be asking more of common law judges than what they are supposed to be doing: pursuing factual accuracy through rational deliberation.<sup>133</sup> To do justice in a technological world, judges—and lawyers educating them about their cases—must learn to grapple with the scientific method.

### C. Does *Daubert* Let More or Less Evidence In?

Many commentators predicted that the *Daubert* decision would result in the diminished admissibility of scientific evidence, and proclaimed it a stricter standard than *Frye v. United States*,<sup>134</sup> which the Court explicitly overruled.<sup>135</sup> Other commentators noted the anomaly that the testimony at issue in *Daubert* was clearly outside the scientific mainstream, which should widen the kinds of evidence courts would admit.<sup>136</sup> Although *Daubert's* effect on

130. See, e.g., *Confronting the New Challenges*, *supra* note 10, at 1493-1509 (observing that “the doctrine purportedly relied on by the courts in evaluating novel scientific evidence is of little use in explaining and predicting the results in particular cases” and noting that “[s]everal functional criteria, defensible to varying degrees on normative grounds, underlie the obscuring layer of doctrine and offer greater explanatory and predictive power”).

131. Bert Black, *Winning the Expert Wars in the Age of Daubert*, SB16 ALI-ABA 13, 15 (1996).

132. Ronald J. Allen, *Expertise and the Daubert Decision*, 84 J. CRIM. L. & CRIMINOLOGY 1157, 1169 (1994) (stating that changes wrought by *Daubert* are positive in “reduc[ing] the hiding places for judges, and . . . forc[ing] them to focus somewhat more explicitly on whether proffered testimony will be helpful, which is to the good”).

133. Faigman, *supra* note 29, at 429 (arguing that because “the decision about whether a variable produced (or produces) an effect having a legal consequence is, fundamentally, a policy decision, judges must make it . . . requir[ing] judges to become sophisticated consumers of science so that they can impose independent judgment on the research”).

134. *Frye v. United States*, 293 F. 1013 (D.C. Cir. 1923). For a survey indicating that two-thirds of post-*Daubert* products liability cases citing *Daubert* excluded expert testimony, see Jonathon Hoffman, *A Briefcase and an Opinion: Post-Daubert Expert Testimony—A Major Shift*, 22 Prod. Safety & Liab. Rep. (BNA) 379 (Apr. 8, 1994).

135. *Daubert v. Merrell Dow Pharms., Inc.*, 509 U.S. 579, 589 (1993).

136. See, e.g., Jay P. Kesan, Note, *An Autopsy of Scientific Evidence in a Post-Daubert World*, 84 GEO. L.J. 985, 1013 (1996) (observing that “[a]s one might reasonably expect from a more liberal admissibility requirement, post-*Daubert* courts are admitting more scientific evidence in civil and criminal cases”). For an example of the dilemma, see, e.g., *McKnight ex rel*

admissibility—whether more or less evidence will be found admissible under the new ruling—is a frequent topic of debate, it is a red herring.

Rather than a question of more or less evidence being admitted under the *Daubert* gatekeeping standards,<sup>137</sup> it is instead a question of requiring purportedly scientific evidence to justify itself on scientific grounds.<sup>138</sup> The Court in *Daubert* attempted to bring the legal and the scientific standards to evaluate scientific evidence closer together without permitting the judiciary to cede authority for what are essentially judicial policy decisions to non-judicial actors.<sup>139</sup>

#### *D. How Does the Daubert Question Arise?*

Challenges to scientific validity of expert testimony ordinarily should be addressed prior to trial, in a preliminary hearing pursuant to Rule 104.<sup>140</sup> They may, however, arise in a number of other circumstances. They may be raised in a motion in limine at trial.<sup>141</sup> *Daubert* itself arose in the context of the defendants' summary judgment motion.<sup>142</sup> Occasionally, defendants who

*Ludwig v. Johnson Controls, Inc.*, 36 F.3d 1396 (8th Cir. 1994), where plaintiff argued that *Daubert* makes expert testimony more readily admissible, while defendant argued that *Daubert* makes expert testimony less readily admissible. *Id.* at 1406.

137. See *United States v. Scholl*, 959 F. Supp. 1189, 1191 (D. Ariz. 1997) (noting that the "debate over whether the new test would be more liberal (i.e., allow more expert testimony) or would be more conservative (i.e., allow less expert testimony) . . . cannot be answered simply . . . [; rather] *Daubert* has become synonymous with the 'validity' test").

138. The impact and import of *Daubert* has been hotly debated by academics and practitioners alike. See, e.g., Hoffman, *supra* note 134, at 379; Eric T. Berkman, *Ruling on Expert Evidence Hasn't Opened Floodgates*, MASS. L. WKLY., Jan. 6, 1997, at 1 (noting that while *Daubert* may broaden the field of what kinds of challenges are available, it also makes more kinds of things admissible); Marcia Coyle, *Cert. Granted For Expert Witness Case*, NAT'L L.J., Mar. 31, 1997, at B1 (quoting evidence professor David I. Faigman as stating that "[i]nitial reaction to *Daubert* was that it might be a more liberal rule, and so more testimony would come in. . . . The reality is a lot of district courts have used *Daubert* to exclude, particularly when evidence comes from less traditional areas of science").

139. See Allen, *supra* note 132, at 1163 (noting that deference model of judicial decision making about expert opinion endorsed by the *Frye* standard is "at odds with the essence of the common law mode of trial—the pursuit of factual accuracy through rational deliberation").

140. *Hose v. Chicago N.W. Trans. Co.*, 70 F.3d 968, 973-74 (8th Cir. 1995) (finding that because defendant brought no pretrial challenge to proffered polysomnogram evidence relating to sleep disorders, district court did not abuse its discretion in admitting expert testimony and rejecting last minute challenge); *Waitek v. Dalkon Shield Claimants Trust*, 934 F. Supp. 1068, 1079-80 (N.D. Iowa 1996) (declining to reject plaintiffs' expert evidence where defendants failed to make objections under *Daubert* either before the trial or during direct examination; however, because defense motions to set aside the verdict were based on insufficiency of evidence, court heard the motion).

141. See *Isely v. Capuchin Province*, 877 F. Supp. 1055, 1058 n.4 (E.D. Mich. 1995) (stating that although motions in limine should be filed well before trial, they are "permissible at any point").

142. *Daubert v. Merrell Dow Pharms., Inc.*, 727 F. Supp. 570 (S.D. Cal. 1989). In *Daubert*, the parents of children born with defects reducing the size of their limbs brought suit against the manufacturer of the morning sickness remedy Bendectin the mothers had taken during their pregnancies. *Id.* at 571. When presented with defendants' epidemiologic evidence that Bendec-

have failed to challenge scientific evidence at trial attempt to raise the issue on appeal. The appellate courts have examined the trial courts' determinations for "plain error" cursorily, but without a full *Daubert* hearing and generally without giving the defendants relief.<sup>143</sup> If the issue is raised subsequent to trial, the question will be whether the testimony met the requirements of Rule 702 at the time of the lower court's admissibility ruling.<sup>144</sup> In any event, unless the evidence is specifically challenged, the court may not exercise its gatekeeping authority.<sup>145</sup> Of course, in the criminal context, failure to challenge expert testimony may itself, under extreme circumstances, be subject to challenge as ineffective assistance of counsel.<sup>146</sup>

*Daubert* does not apply at sentencing hearings.<sup>147</sup> It is important to bear in mind that although *Daubert* may be raised in a habeas petition,<sup>148</sup> it raises an evidentiary question, not a constitutional one. Thus, whether the evidence violates a given specific constitutional guarantee is a question of probativity versus unfair prejudice rather than satisfaction of the *Daubert* standard.<sup>149</sup> Nonetheless, if the probativity is so minuscule because of the test's scientific invalidity that it tips the scale toward unfair prejudice, that should be sufficient to reopen the question. Further, the failure of the court to provide resources for defense experts may be a violation of due process.<sup>150</sup>

A troubling trend in at least one jurisdiction is the holding of simultaneous *Daubert* hearings and deposition of experts.<sup>151</sup> It is difficult to fathom how a rigorous inquiry into the scientific validity of the proposed testimony would be possible in such circumstances. In criminal trials, with their less

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tin does not cause birth defects, plaintiffs countered with reanalyses of defendants' evidence. *Id.* at 573. The court found this evidence inadmissible and granted defendants' motion for summary judgment. *Id.* at 573-75.

143. *See, e.g.*, *United States v. Sherwood*, 98 F.3d 402, 408 (9th Cir. 1996) (limiting review to plain error analysis of fingerprint testimony because no challenge at trial); *Hose*, 70 F.3d at 973 n.3 (maintaining challenges to scientific reliability ordinarily should be addressed prior to trial).

144. *United States v. Bonds*, 12 F.3d 540, 553 (6th Cir. 1993).

145. *McKnight ex rel Ludwig v. Johnson Controls, Inc.*, 36 F.3d 1396, 1407 (8th Cir. 1994).

146. *See Williamson v. Ward*, 110 F.3d 1508, 1520 (10th Cir. 1997) (holding failure to investigate defendant's mental illness or seek competency hearing was ineffective assistance of counsel).

147. *United States v. McCaskey*, 9 F.3d 368, 380 (5th Cir. 1993) (stating *Daubert* "has no application at sentencing[;]" evidence must only have "sufficient indicia of reliability to support its probable accuracy").

148. *Milone v. Camp*, 22 F.3d 693 (7th Cir. 1994).

149. *Id.* at 701.

150. *Ake v. Oklahoma*, 470 U.S. 68 (1985) (recognizing a due process right to expert assistance for indigent defendants); *Williamson v. Reynolds*, 904 F. Supp. 1529, 1562 (E.D. Okla. 1995) ("When forensic evidence and expert testimony are critical parts of the criminal prosecution of an indigent, due process requires the state to provide an expert who is not beholden to the prosecution.").

151. *See, e.g.*, *Joint E. & S. Dists. Asbestos Litig. v. Johns Manville Corp.*, 151 F.R.D. 540, 544 (S.D.N.Y. 1993) (ordering joint hearings and depositions to eliminate duplicative discovery and harassment of experts).



extensive discovery rights and fewer resources, this trend may pose an even more significant handicap to the defense.<sup>152</sup>

### *E. Did Daubert Improve Consistency in the Courts?*

At least one reading of the Supreme Court's opinion is that its emphasis on the judge's gatekeeping role was an effort to achieve consistency—at a high level of rationality—in the way courts handle scientific evidence.<sup>153</sup> The growing use of scientific evidence and its importance in criminal prosecutions<sup>154</sup> makes a perceived lack of consistency a real concern for the fairness of the justice system.<sup>155</sup> Although consistency without rationality obviously will not solve the problem of fairness,<sup>156</sup> inconsistent results implicate the rationality behind at least some of the decisions.<sup>157</sup> There is good basis for concern: if the object of the justice system is a search for truth—even acknowledging that truth is socially constructed—courts should be reluctant to allow juries in different jurisdictions to decide common issues of logic differently.<sup>158</sup> The evidentiary merits of a particular branch of science—that inquiry contemplated by the “methodology and reasoning” categories of the *Daubert* standard—need to be examined and articulated as the subject of judicial policymaking that is the prototypical province of the judge.

Because the *Frye* general acceptance test was adopted by the vast majority of jurisdictions, uniformity of standards was not a problem the Supreme

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152. See Berger, *supra* note 14, at 53 (stating that “the accused may be more handicapped in challenging expert scientific proof offered against him or her than the civil litigant because of less extensive discovery rights and fewer resources”).

153. See *Confronting the New Challenges*, *supra* note 10, at 1498 (stating that “given the essentially ‘objective’ nature of the scientific enterprise, courts should be reluctant to allow juries in different jurisdictions to decide common issues differently”).

154. See Joseph L. Peterson et al., *The Uses and Effects of Forensic Science in the Adjudication of Felony Cases*, 32 J. FORENSIC SCI. 1730, 1748 (1987) (citing a study that showed that about one-fourth of jurors interviewed after having served on trials involving scientific evidence and resulting in convictions believed that had such evidence been absent they would have changed their verdicts from guilty to not guilty).

155. Faigman, *supra* note 29, at 412 (noting that “given the essentially ‘objective’ nature of the scientific enterprise, courts should be reluctant to allow juries in different jurisdictions to decide common issues differently”).

156. Thus, courts that circumvent considered analysis by taking judicial notice of prior admissibility decisions may be increasing consistency at the price of decreasing rationality. As the Court observed, “the Rules [of Evidence]—especially Rule 702—do assign to the trial judge the task of ensuring that an expert’s testimony both rests on a reliable foundation and is relevant to the task at hand.” *Daubert v. Merrell Dow Pharms., Inc.*, 509 U.S. 579, 597 (1993). That is not to say that a court must ignore widespread acceptance of particular principles and methodologies; it is one of the factors a court ought to take into consideration. *Id.* at 594. But it is no longer the only factor. Courts must now examine the error rate, existence, and maintenance of standards controlling the technique’s operation, and peer review and publication. *Id.* at 593-94.

157. For a law and economics argument that judicial consistency is not desirable, and that the lack of consistency under *Daubert* is a good thing because a dispersion of admissibility outcomes indicates that interest groups have less to gain (and less influence over judicial decisions) under *Daubert*, see Parker, *supra* note 79, at 49.

158. Faigman, *supra* note 29, at 411.

Court sought to correct, even though uniformity of result varied widely. Thus, evidence that was perfectly acceptable in one jurisdiction often was inadmissible in another, although both applied the same general acceptance standard. The admissibility of voiceprint evidence (sound spectrography), for example, varied widely under the general acceptance standard. Psychiatric testimony concerning future dangerousness, still admissible in Texas<sup>159</sup> (and upheld by the Supreme Court in the face of acknowledged disapproval by the scientific community<sup>160</sup>), was excluded under *Frye* in the District of Columbia.<sup>161</sup>

The Supreme Court effected a complete upheaval in the uniformity of standards. Now, rather than a single widely applied standard, a myriad of approaches flourish. Most obviously, *Daubert* is a federal standard, involving construction of the Federal Rules of Evidence, leaving state courts nominally free to follow the old general acceptance test. Although most states have adopted rules of evidence modeled on the federal rules, they need not construe the rules the same way the Supreme Court does.<sup>162</sup> Thus, the standards of analysis may vary according to jurisdiction, causing widespread variations in the admissibility of particular types of evidence. Arkansas, for example, rejects *Daubert*, although it uses a similar reliability/relevance approach.<sup>163</sup> New York, California, Connecticut, and Florida have rejected *Daubert* in favor of the *Frye* standard.<sup>164</sup> Texas, on the other hand, has adopted the *Daubert* standard.<sup>165</sup>

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159. TEX. CODE ANN. § 37.071(b)(2)(1) (West Supp. 1993). Although Texas has not abandoned its use of psychiatric testimony about future dangerousness, its continued admissibility is explained because this kind of testimony simply has not been subjected to *Daubert* analysis. See *Rogers v. Director, TDCJ-ID*, 864 F. Supp. 584, 591 (E.D. Tex. 1994).

160. *Barefoot v. Estelle*, 463 U.S. 880, 897-99 (1983) (maintaining that although psychiatric predictions of future dangerousness were wrong two out of three times, such testimony was not so unreliable it should be ignored).

161. *In re Wilson*, 33 Crim. L. Rep. (BNA) 2115 (D.C. Super. Ct. Apr. 14, 1983) (involving civil commitment proceedings).

162. See, e.g., *State v. Bible*, 858 P.2d 1152, 1182-83 (Ariz. 1993) (emphasizing that state courts—even those that have adopted Federal Rules of Evidence—are not bound by *Daubert*, which interprets only federal law and not the Constitution).

163. *Moore v. State*, 915 S.W.2d 284, 292 (Ark. 1996) (adopting the relevancy approach of *Prater v. State*, 820 S.W.2d 429, 431 (Ark. 1991)). Although Arkansas has adopted a detailed approach to analyzing the admissibility question, it does not necessarily adhere to a rigorous analysis in all cases, however. See *id.* For example, in *Peebles v. State*, 808 S.W.2d 331 (Ark. 1991), the supreme court found admissible a physician's testimony identifying film on victim's body as semen by using an ultraviolet lamp although the physician had not previously been qualified to testify as an expert, had never before used the ultraviolet lamp, and conceded that the lamp would illuminate substances other than semen. *Id.* at 334; see also *Isbell v. State*, 931 S.W.2d 74, 78 (Ark. 1996) (admitting gunshot residue testimony despite concessions that the test had been administered without controls, test was incomplete and its result jeopardized, finding such factors would go to weight rather than admissibility).

164. *People v. Leahy*, 882 P.2d 321, 331 (Cal. 1994); *State v. Porter*, 698 A.2d 739 (Conn. 1997); *Flanagan v. State*, 625 So. 2d 827, 828 (Fla. 1993); *People v. Wesley*, 633 N.E.2d 451, 454 (N.Y. 1994). As of 1995, twenty-two states were continuing to apply the *Frye* rule. Joseph R. Meany, *From Frye to Daubert: Is a Pattern Unfolding?*, 35 JURIMETRICS J. 191, 193-94 (1995).

165. *E.I. du Pont de Nemours & Co., Inc. v. Robinson*, 923 S.W.2d 549, 556 (Tex. 1995).

Moreover, even among federal courts, which must apply the *Daubert* standard,<sup>166</sup> considerable disagreement exists over what kinds of expert testimony must be subjected to a *Daubert* analysis. In the great categorization debate over whether evidence—especially in criminal trials—should be classified as science or “technical nonscience,” the Second,<sup>167</sup> Fourth,<sup>168</sup> and Ninth<sup>169</sup> Circuits explicitly have limited *Daubert* analysis to scientific evidence, exempting evidence they consider “technical” from rigorous analysis. An example of this kind of differential analysis can be seen in the Tenth Circuit’s *Muldrow*<sup>170</sup> opinion. There the court implicitly limited *Daubert* to scientific knowledge and excluded technical expertise.<sup>171</sup> It subjected to *Daubert* analysis a chemist’s testimony identifying the subject collected in a drug bust as cocaine while omitting such analysis with respect to a veteran police officer’s expert testimony that the amount recovered in the bust was consistent with distribution rather than personal use.<sup>172</sup> This differential application of standards creates an obvious disparity in results.

There are numerous splits among the circuits about what types of evidence are subject to *Daubert*. First, there is a split over whether *Daubert*’s principles apply to all types of expert evidence. Second, there is disagreement over whether technical expert evidence should be exempted from *Daubert* analysis. Third, among those circuits that assume *Daubert* does not apply to technical evidence, the circuits disagree about whether a particular type of evidence falls into the category “technical” rather than “scientific.” No clear definition of what is “technical” has emerged, although, in general, courts seem to be using it as a catch-all category for criminal identification evidence that is needed for the prosecution, but that cannot withstand scientific scrutiny. An excellent example of this circular reasoning can be found in the Second Circuit’s *Starzeczyzel*<sup>173</sup> decision, where the court held that no *Daubert* hearing was necessary for technical, specialized knowledge such as handwriting analysis, acknowledged the testimony could not meet the *Daubert* standards, and then admitted it anyway as technical knowledge.<sup>174</sup> *Daubert* is thus a problematic resolution to disparate application of admissibility standards.

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166. Some courts manage to circumvent even this fairly uncontroversial mandate. See, e.g., *Hoult v. Hoult*, 57 F.3d 1, 5 (1st Cir. 1995) (declining “to ‘shackle the district court with a mandatory and explicit’ reliability analysis”).

167. See, e.g., *Iacobelli Constr., Inc. v. County of Monroe*, 32 F.3d 19, 25 (2d Cir. 1994) (limiting *Daubert* analysis to novel scientific evidence in order to find geological testimony admissible without applying the *Daubert* standard).

168. *Thornton v. Caterpillar, Inc.*, 951 F. Supp. 575, 578-79 (refusing to apply *Daubert* analysis to mechanical engineering testimony).

169. See, e.g., *Thomas v. Newton Int’l Ent.*, 42 F.3d 1266, 1270 & n.3 (9th Cir. 1994) (finding abuse of discretion in exclusion of expert testimony regarding dangerousness of unguarded vessel hatch cover because *Daubert* applied only to evaluation of scientific expert testimony).

170. *United States v. Muldrow*, 19 F.3d 1332, 1337-38 (10th Cir. 1994).

171. *Id.*

172. *Id.*

173. *United States v. Starzeczyzel*, 880 F. Supp. 1027 (S.D.N.Y. 1995).

174. *Id.* at 1028-29.

Another complication inhibiting uniformity is the disagreement among the circuits over whether the expert's failure to follow valid protocol goes to weight or admissibility.<sup>175</sup> Failure to follow the protocol for a given methodology obviously increases the error rate. Although the general error rate for the properly followed protocol might be acceptable scientifically, failure to follow the protocol may increase drastically the error rate in a particular case, making the evidence unreliable.<sup>176</sup> The question then becomes whether the expert's failure to follow protocol is egregious enough to make the evidence unreliable.<sup>177</sup>

For example, although the Eighth Circuit has taken judicial notice of both restriction fragment length polymorphism (RFLP)<sup>178</sup> and polymerase chain reaction (PCR)<sup>179</sup> DNA identification techniques, it has acknowledged that failure to adhere to standard protocol may cause the evidence to fail under *Daubert's* second prong.<sup>180</sup> The Tenth Circuit agreed that "[i]f the offering party does not follow protocol, the scientific evidence may not be relevant under *Daubert's* second prong because improperly applied science cannot assist the trier of fact."<sup>181</sup> Thus, in the Eighth and Tenth Circuits, at least, challenges to DNA admissibility still may be brought based on performance of the technique.<sup>182</sup> The problem with this approach, however, is that if experts are required to submit affidavits attesting only that the protocols were performed properly—as they were in *Martinez*<sup>183</sup>—leaving it to the opponent to ascertain enough from the affidavits to challenge the particulars, it may be impossible to mount a defense.<sup>184</sup> Placing the burden of demonstrating the inadequacies of government laboratory techniques on already

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175. See *United States v. Davis*, 40 F.3d 1069, 1074-75 & nn.6-7 (10th Cir. 1994) (declining to address split in circuits over whether compliance with protocol goes to weight or admissibility, but noting that "[i]f the offering party does not follow protocol, the scientific evidence may not be relevant under *Daubert's* second prong because improperly applied science cannot assist the trier of fact").

176. Notably, the Supreme Court included error rate as one of its factors for the validity analysis thus presumably intending courts to use this factor in their admissibility determinations, rather than relegating the question to the jury as a question of weight. *Daubert v. Merrell Dow Pharms., Inc.*, 509 U.S. 579, 594 (1993).

177. *United States v. Martinez*, 3 F.3d 1191, 1197-98 (8th Cir. 1993) (stating that even where court takes judicial notice of general theory such as DNA profiling, it must make initial inquiry into particular expert's application of methodology and exclude testimony if errors so infected the procedure as to make it unreliable). As the Eighth Circuit articulated the issue, "error in the application of a reliable methodology should provide the basis for exclusion of the opinion only if that error negates the basis for the reliability of the principle itself." *Id.* at 1198.

178. *Id.* at 1197.

179. *United States v. Beasley*, 102 F.3d 1440, 1448 (8th Cir. 1996).

180. *Martinez*, 3 F.3d at 1197-98.

181. *United States v. Davis*, 40 F.3d 1069, 1074 n.6 (10th Cir. 1994); see also *Martinez*, 3 F.3d at 1197; *United States v. Coronado-Cervantes*, 912 F. Supp. 497, 499 (D.N.M. 1996).

182. *Martinez*, 3 F.3d at 1197.

183. *Id.* at 1198.

184. The *Martinez* case itself reveals fallacy of this approach. There, although the defendant claimed that the government failed to provide adequate discovery, the court gave short shrift to this argument because it was not raised below. *Id.* at 1199.

underfunded criminal defendants may place an insurmountable obstacle in the quest for truth.<sup>185</sup>

In sum, *Daubert* has created quite a maelstrom. It has left issues unresolved and the courts in disagreement over the proper answers. In time these issues will be hammered out, for better or for worse.<sup>186</sup> The courts' discourse with each other and society over what counts as evidence inevitably will become more focused. One thing that *Daubert* cannot be, however, is ignored. It is creating changes in the way courts respond to expert scientific testimony. It is also causing changes in the kinds of evidence that are admitted and in the way evidence is justified, collected, analyzed, and presented.

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185. See Giannelli, *supra* note 20, at 117-28 (giving numerous instances of the obstacles indigent defendants face in obtaining experts and vital discovery in criminal trials); cf. Koehler, *Error and Exaggeration*, *supra* note 112, at 21 (giving numerous instances of unchallenged expert testimony).

186. For example, the Supreme Court, in *General Electric Co. v. Joiner*, 118 S. Ct. 512 (1997), settled debate among the circuits over the proper standard of review. *Daubert* is silent on what standard an appellate court should apply to a trial court validity determination. In *Joiner*, the Supreme Court reiterated that the traditional abuse of discretion standard should be applied. *Id.* at 515. Although most jurisdictions that had addressed the issue applied the abuse of discretion standard to the *Daubert* analysis, at least one court applied a heightened abuse standard, in which the trial court's decision was revisited, though some deference was paid to its determination. *In re Paoli R.R. Yard PCB Litig.*, 35 F.3d 717, 763-65 (3d Cir. 1994). Some courts added a further refinement: a two step standard of review in which the reviewing court first undertook de novo review to determine whether the trial court had properly followed the *Daubert* framework. If so, the appellate court will review only for abuse of discretion. *United States v. Hall*, 93 F.3d 1337, 1342 (7th Cir. 1996). The Sixth Circuit advocated a three-part standard of review in which the expert's qualifications were reviewed under a clear error standard, the helpfulness of the testimony under an abuse of discretion standard, and scientific validity under de novo review. See *Cook v. American S.S. Co.*, 53 F.3d 733, 738 (6th Cir. 1995) (declining to follow de novo standard, while acknowledging its "intuitive appeal" with respect to scientific evidence). The Eleventh Circuit, according to the Supreme Court in *Joiner*, applied an overly stringent standard of review when it overturned the district court's finding that Joiner's experts had failed to show that his exposure to PCB "promoted" his lung cancer. *Joiner*, 118 S. Ct. at 516. The Eleventh Circuit had reasoned that the Federal Rules of Evidence display a preference for admissibility, and thus applied a stringent standard of review. *Id.* The Supreme Court explained that, although *Daubert* allows the district courts to admit a "somewhat broader range" of evidence than under *Frye*, a court of appeals "may not categorically distinguish between rulings allowing expert testimony and rulings which disallow it." *Id.* at 517. The *Joiner* opinion is not particularly surprising, upholding as it does the standard of review. Conceptually, however, there does not seem to be any sound basis for assuming the appellate court is any less competent in reviewing scientific evidence de novo than the trial judge. The traditional reason for deferring to the trial judge on evidentiary rulings is that the trial judge has the benefit of reviewing the demeanor of the witness to determine whether the witness is lying. Because it is not the witness's credibility at stake in scientific evidence, but the validity of the underlying methodology and application, it is not necessary to give the trial judge's observation any particular weight. Moreover, the jurisprudential policy issues transcending the facts of a given case are more appropriately resolved by appellate courts.

### III. MAJOR AREAS OF CHANGE: POST-*DAUBERT* DEVELOPMENTS IN SCIENTIFIC EVIDENCE

Judges who give undue deference to scientific experts by evading *Daubert* analysis, either through categorizing such evidence as technical (and therefore nonscientific) or by judicial notice without analysis, are abdicating their responsibilities and perpetrating injustice, especially in criminal trials. For example, experts appear for the defense in only a small percent of criminal cases.<sup>187</sup> Less extensive discovery rights and fewer resources add to defendants' handicap.<sup>188</sup> In a survey of death penalty attorneys, more than half felt that the court provided insufficient funds for investigation of the facts and expert witnesses.<sup>189</sup> The result is a weighting of the evidence in the prosecution's favor.

Permitting experts to testify beyond the bounds of their expertise—a frequent occurrence in criminal trials—only makes matters worse.<sup>190</sup> Examples abound of forensic pathologists who have been allowed to testify about how guns work and the caliber of deformed bullets, a field obviously outside their area of expertise.<sup>191</sup> There probably have been an equal number of ballistics experts permitted to testify about the character of wounds, an equally reprehensible practice.<sup>192</sup>

These factors add an additional layer of unfairness to the lack of rigorous empirical testing from which so many widely-used identification techniques suffer.<sup>193</sup> As noted above, although now discredited, voiceprint

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187. See HARRY KALVEN, JR. & HANS ZEISEL, *THE AMERICAN JURY* 137-140 (1966) (stating that in only 6% percent of all criminal trials is a defense expert used); Berger, *supra* note 10, at 1359 (citing studies that show courts rarely grant requests for expert witnesses). Although a defendant has due process rights to an expert under *Ake v. Oklahoma*, 470 U.S. 68 (1985), the defense must still prove need, a factor that often presents significant difficulty. *Id.* at 76; see Sonja L. DeWitt, Note, *The Indigent Criminal Defendant, DNA Evidence and the Right to an Expert Witness: A Comparison of the Requirements of Due Process in State v. Dubose and Harris v. State*, 6 B.U. PUB. INT. L.J. 267, 274 (1996) (discussing how *Ake* rationale, finding due process right to psychiatrist at trial, applies equally to DNA cases); cf. James E. Starrs, *Recent Developments in Federal and State Rules Pertaining to Medical and Scientific Expert Testimony*, 34 DUQ. L. REV. 813, 815 (1996) (noting that it is rare for experts to testify for defense in criminal cases involving persons of little means).

188. See Berger, *supra* note 14, at 53 (observing that “the accused may be more handicapped in challenging expert scientific proof proffered against him or her than the civil litigant because of less extensive discovery rights and fewer resources”).

189. Marcia Coyle et al., *Fatal Defense: Trial and Error in the Nation's Death Belt*, NAT'L L.J. 30, 40 (June 11, 1990).

190. See Koehler, *Error and Exaggeration*, *supra* note 112, at 21 (1993) (citing numerous instances of unchallenged expert testimony beyond their expertise).

191. Bert Black, *A Unified Theory of Scientific Evidence*, 56 FORDHAM L. REV. 595, 664 (1988).

192. See R.J. Joling & W.W. Stern, *An Overview of Firearms Identification for Attorneys III: Qualifying and Using the Firearms Examiner as a Witness*, 26 J. FORENSIC SCI. 166, 170 (1981) (noting problem).

193. See Berger, *supra* note 11, at 1354-55 (observing that some of most venerable branches of forensic science—such as fingerprinting, ballistics, and handwriting analysis—have never demonstrated ability to make unique identifications).

analysis was once a widely used identification method that was never empirically tested.<sup>194</sup> Yet, in approximately eighty percent of the cases in which such evidence was admitted, no opposing expert testified for the defense.<sup>195</sup>

A further example of the courts' undue deference to scientific experts is their failure to demand that forensic and toxicology laboratories submit their findings and procedures to rigorous independent testing.<sup>196</sup> Independent testing is necessary because even where there is some empirical justification for a given methodology, its use in a forensic laboratory may be problematic. Errors such as sample-switching and contamination invalidate results. DNA "fingerprinting," for example, is enormously controversial, not because of any challenge to the scientific basis for detecting genetic differences between individuals, but because of the absence of proficiency testing in the laboratories employing the technique.<sup>197</sup>

The controversial nature of the statistical estimates involved provides a further basis for challenging DNA typing. One example is the exaggeration of evidentiary significance by the sheer magnitude of the odds given for DNA matches.<sup>198</sup> Scientific evidence in criminal trials nearly always involves a

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194. See Bert Black, *Science and the Law in the Wake of Daubert: A New Search for Scientific Knowledge*, 72 TEX. L. REV. 715, 739 & n.159 (1994) (stating that "the assumption that no two persons produce the same sound spectrogram had never been verified; nor had anyone ever tested whether a person can intentionally change his voice to alter his spectrogram or to produce the same spectrogram as someone else").

195. NATIONAL RESEARCH COUNCIL, ON THE THEORY AND PRACTICE OF VOICE IDENTIFICATION 49 (1979). The extensive scrutiny given DNA evidence illuminates the utter lack of empirical basis for most purportedly scientific identification tests. See generally Saks & Koehler, *supra* note 10, at 361 (the extensive scrutiny given DNA evidence reveals that there is a lack of empirical support for most forensic evidence and noting that the widely asserted assumptions that no two fingerprints, gun barrel markings, writings, or tool marks is the same lacks empirical support).

196. Moenssens, *supra* note 13, at 16-17. Although sloppy technique and faulty instrumentation probably is a more significant source of error than blatant falsification, in either event, the result is an intolerable miscarriage of justice.

197. Appropriate scientific standards are widely ignored in forensic laboratories, according to Andre A. Moenssens, who notes that "[e]xperts and crime laboratories did not fare well in proficiency testing conducted by their own professional organization." *Id.* at 10. See generally William C. Thompson, *Evaluating the Admissibility of New Genetic Identification Tests: Lessons from the "DNA War"*, 84 J. CRIM. L. & CRIMINOLOGY 22 (1993); see also James P. O'Brien, Jr., Note, *DNA Fingerprinting: The Virginia Approach*, 35 WM. & MARY L. REV. 767, 781 (1994) (identifying the "major hurdle that DNA fingerprinting must overcome: DNA typing is capable, in principle, of an extremely low inherent rate of false-positive results, so the risk of error will come from poor laboratory practice or sample handling and labeling, and because DNA typing is technical, a jury requires the assurance of laboratory competence in test results") (quotations and internal citations omitted). Proper testing procedures are critical to the accuracy of forensic evidence. The NRC, for example, issued a report on DNA testing recommending stricter standards for certifying and testing forensic laboratories. NATIONAL RESEARCH COUNCIL, DNA TECHNOLOGY IN FORENSIC SCIENCE (Apr. 14, 1992) [hereinafter DNA TECHNOLOGY].

198. One case cited odds as one in 340 billion, more people than have ever lived on earth. See *People v. Lindsey*, 868 P.2d 1085 (Colo. Ct. App. 1993). The NRC of the National Academy of Sciences issued a report in 1993, finding DNA typing generally reliable (depending on the particular method employed) but calling for use of a "ceiling" principle in statistical analyses

proffered probability statement, yet few judges have attempted to understand the statistical basis of these statements and their underlying assumptions.<sup>199</sup> Statistical errors routinely are committed even by defense attorneys, suggesting that lawyers as well as judges could benefit from increased training in probability theory.<sup>200</sup>

### A. Taking *Daubert* Seriously

Circumventing the *Daubert* mandate to examine the underlying validity of proposed expert testimony is all the more shocking because performing the *Daubert* analysis is not difficult. There are judges who apply *Daubert* routinely and well and whose rigorous standards should serve as a model to those overwhelmed by their gatekeeping responsibilities.

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where the highest frequency for any population sub-group would be used if there were any differences between population groups. DNA TECHNOLOGY, *supra* note 198, at 51-54, 81-83. For a discussion of the ceiling principle, see Scheck, *supra* note 25, at 1970-75. For an example of what a difference the statistical assumptions can make, see *United States v. Bonds*, 12 F.3d 540 (6th Cir. 1993) (ignoring the ceiling principle and the NRC Report that would have given odds of 1 in 17 that the DNA in question could have been someone other than the defendant's, the jury was given odds of 1 in 35,000), *affg* *United States v. Yee*, 134 F.R.D. 161 (N.D. Ohio 1991). See Scheck, *supra* note 25, at 1992. Statistical errors are by no means the only ones implicated in DNA testing. For example, testifying forensic scientists are often reluctant to admit the possibility (and implications) of false positive tests, although technical errors such as, in the case of DNA testing, enzyme failures, abnormal salt concentrations, and dirt specs and human error, can all produce misleading DNA banding patterns, which may cause false positive testing. Koehler, *Error and Exaggeration*, *supra* note 112, at 23 & nn.4-9. Other frequent statistical mistakes of experts in testifying about DNA identification evidence include use of a non-case specific reference population based on the ethnic group of the suspect (which may result in errors for instance, if the suspect population could include the suspect's relatives, making the probability of a match increase dramatically). *Id.* at 28 & n.24. Poorly estimating the number of people who would need to be tested (the sample size) before finding a DNA match may exaggerate the probative strength of this evidence. *Id.* at 34 & nn.49-51. The NRC recognized the controversial nature of probability estimates an expert may make when DNA tests indicate a "match" due to factors that may seriously underestimate coincidental matches, such as the frequency with which particular gene components are found within a given population and whether these particular components are independently inherited and proposed using a ceiling principle so that the assigned probability of a match will always be greater than the true probability. DNA TECHNOLOGY, *supra* note 198, at 13-14, 82-85.

199. A forensic expert offering hair evidence may, for example, opine that the possibility of a hair found at the scene of the crime coming from someone other than the accused in one chance in several thousand. See, e.g., *United States v. Massey*, 594 F.2d 676, 679 (8th Cir. 1979) (noting expert testified that three out of five hairs found in ski mask worn during robbery were microscopically similar to one or more of nine mutually dissimilar hairs taken from the defendant and that there was only one chance in 4500 that hairs in ski mask could have come from someone other than defendant). It is important to be alert to possible statistical fallacies underlying these assertions. See FINKELSTEIN & LEVIN, *supra* note 107, at 88-89 (discussing the *Massey* case and expressing doubt that any hair could be similar to more than one of nine mutually dissimilar hairs).

200. See David H. Kaye, *Thinking Like a Statistician: The Report of the American Statistical Association Committee on Training in Statistics in Selected Professions*, 34 J. LEGAL EDUC. 97 (1984) (observing that statistical argument is not taught by 76% law schools answering survey—consisting of 90% of all ABA-approved law schools).



Judge Edward R. Becker's opinion in *In re Paoli Railroad Yard PCB Litigation*<sup>201</sup> offers a model outline for analysis. There, in remanding plaintiffs' chemical exposure injury claims, Judge Becker addressed the need for a judge to examine every step in an expert's reasoning.<sup>202</sup> In addition to assessing the investigative process used by an expert, a judge also must make an independent assessment of the reliability of an expert's data.<sup>203</sup> Moreover, Judge Becker noted that methodology and its application were frequently intertwined.<sup>204</sup> He further noted that assessing the importance of any particular factor requires comparison with possible alternative causes.<sup>205</sup>

A district court in the Eastern District of Pennsylvania used this kind of a framework in *United States v. Atlas Minerals and Chemicals, Inc.*,<sup>206</sup> an environmental action. The court denied the defendant beverage manufacturer's motion to strike an expert witness who was prepared to testify that the manufacturer's process for removing labels from returnable bottles yielded hazardous waste products.<sup>207</sup> The expert was a chemical engineer, who, instead of independently testing the waste materials, relied upon the defendant's own answers to interrogatories, deposition testimony of waste haulers, and exhibits for his conclusions.<sup>208</sup> The beverage manufacturer objected to his qualifications to render an opinion about the hazardous content of its waste, contending that an analytical or physical chemist was required.<sup>209</sup> The court disagreed, finding that the expert did not need any particular degree as long as he had the combined knowledge, skill, experience, training, and education necessary to make an evaluation of the data generated by the manufacturer in its defense.<sup>210</sup> Nor did the expert need to test the waste personally in order to testify about the nature of the waste bottle-washing normally produces.<sup>211</sup> Interpreting the data generated by the manufacturer to reach a contrary conclusion was permissible, although the conflicting conclusions of the experts might raise a difficult issue of fact.<sup>212</sup>

The judges in the Third Circuit are not the only ones able to apply *Daubert* well. In the Eastern District of Oklahoma, *Williamson v. Reynolds*<sup>213</sup> involved an assessment of hair analysis claims by the government and exemplifies a court's understanding of scientific issues. The government presented an expert who testified that, of the hundreds of hairs found at the

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201. 35 F.3d 717 (3d Cir. 1994).

202. *Id.* at 742.

203. Under this part of the analysis, the judge is making a Rule 703 analysis, using the same standards as those used in Rule 702's reliability determination. *Id.* at 747.

204. *Id.* at 743.

205. *Id.*

206. No. CIV.A.91-5118, 1993 WL 485561 (E.D. Pa. Nov. 15, 1993).

207. *Id.* at \*4.

208. *Id.* at \*3.

209. *Id.* at \*1.

210. *Id.*

211. *Id.*

212. *Id.* at \*4.

213. 904 F. Supp. 1529 (E.D. Okla. 1995).

murder scene and submitted to the laboratory for analysis, two scalp hairs and two pubic hairs were “consistent microscopically” with the defendant’s.<sup>214</sup> But because the expert failed to explain which of the twenty-five characteristics he examined were consistent, due to the absence of standards for determining whether the samples were consistent, and because the expert could not explain how many other people might be expected to share the same combination of characteristics, the court disallowed the testimony.<sup>215</sup> The court noted that although hair analysis “has become a familiar and common component of criminal prosecutions,” it has been criticized as being too subjective and having a high error rate.<sup>216</sup> Judge Seay explained that independent studies showed that the method used by the expert in this case was especially subject to erroneous conclusions, because the expert knew which hair samples came from the crime scene and which came from the crime suspect.<sup>217</sup> In checking its conclusion that the proffered hair analysis was unscientific, the court found no general acceptance, because the only consensus about such evidence was among hair experts, “who are generally technicians testifying for the prosecution, not scientists who can objectively evaluate such evidence.”<sup>218</sup> Thus, although the expert may have followed procedures accepted by other hair experts, the results were scientifically unreliable, despite a long history of admissibility.<sup>219</sup>

Applying a *Daubert* framework of analysis to the social psychology of coerced confessions, Judge McDade, in *United States v. Hall*,<sup>220</sup> examined the expert’s qualifications.<sup>221</sup> At issue was whether the defense expert could testify about factors that frequently correlated with false confessions.<sup>222</sup> The reason the defense wished to introduce this testimony was to counter the widely-held assumption that only guilty people confess.<sup>223</sup> The problem the court faced was that the first of the *Daubert* criteria, testability, seems keyed to a paradigm of experimental laboratory science rather than the so-called “soft” (or social) sciences.<sup>224</sup> The science of social psychology in general, and the specialty of coerced confessions in particular, however, rely on data

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214. *Id.* at 1554.

215. *Id.*

216. *Id.* at 1555. The court noted further that in a study conducted by the Law Enforcement Assistance Administration (in response to criticism of the high error rate in forensic analysis) the error rates on hair analysis were “as high as 67% on individual samples, and the majority of the police laboratories were incorrect on 4 out of 5 hair samples analyzed.” *Id.* at 1556.

217. *Id.* at 1557.

218. *Id.* at 1558.

219. *Id.*

220. 974 F. Supp. 1198 (C.D. Ill. 1997).

221. The expert had a doctorate in social psychology and a thirty-five year academic career, written and published extensively. *Id.* at 1203.

222. *Id.* at 1204.

223. *Id.* at 1206.

224. Karl Popper, whom the Supreme Court cited in its testability section, explicitly developed this standard to distinguish what he considered the “real” or “hard” sciences from the economics of Karl Marx and the psychology of Sigmund Freud. See *supra* notes 97-98 and accompanying text.

generated through systematic observation rather than controlled experimentation. Although the court was tempted to bypass *Daubert* by categorizing the expertise involved as "technical," it nonetheless analyzed the proffered evidence under what it termed a "*Daubert* framework."<sup>225</sup>

Not surprisingly,<sup>226</sup> the court had no difficulty qualifying the expert in the field of coerced confessions.<sup>227</sup> What was more difficult for the court was assessing whether the methodology comported with the scientific method. Field testing rather than laboratory testing is the norm for the field of social psychology. The court found that although the expert and other social psychologists used observational as opposed to experimental techniques, social psychology was nevertheless a sufficiently reliable body of specialized knowledge to be admissible under Rule 702.<sup>228</sup> Effectively, the court recognized that there is more than one scientific method.<sup>229</sup> Yet, that does not mean that there are no standards in the social sciences or that they are inaccessible to critique.

In making its determination, the *Hall* court examined the development of the field of social psychology and its subspecialty of coerced confessions.<sup>230</sup> The court noted that hundreds of studies had been performed and carefully examined the nature of the studies and the analysis of data generated by the studies.<sup>231</sup>

The court explained that the study method involved examination of the post-confession narrative statements of known false confessions (documented cases where people had confessed to crimes that were later proved to have been committed by someone else) together with scrutiny of the interrogation techniques used (as determined through audio- or videotapes or by subsequently interviewing the parties about the details of the interrogation) to determine which documented factors correlated with the elicitation of false confessions.<sup>232</sup> Statistical analysis was used to find which of these factors predominated in false confessions. Additional studies used statistical techniques to correlate the accused's personality traits and intelligence with the false confessions.<sup>233</sup>

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225. *Hall*, 974 F. Supp. at 1202.

226. The qualification test is rather easily met, so it is not surprising that a well-published academic in the field of coerced confessions should meet the qualifications of an expert in coerced confessions.

227. *Hall*, 974 F. Supp. at 1204.

228. *Id.*

229. See, e.g., RICHARD C. LEWONTIN, FACTS AND FACTIONS IN NATURAL SCIENCE IN QUESTIONS OF EVIDENCE: PROOF, PRACTICE AND PERSUASION ACROSS THE DISCIPLINES 478, 489 (James Chandler et al. eds., 1994) ("The demands for rigor of experimental design in theoretical inference vary widely in science from field to field, sometimes between very closely allied domains of research.").

230. *Hall*, 974 F. Supp. at 1203.

231. *Id.* at 1204.

232. *Id.* at 1203.

233. *Id.* at 1204.

From this method, social psychologists were able to conclude that the major distinguishing factor for false confessions is the interrogator's continued use of coercion either through false accusations or false promises of leniency. Interrogators apparently believe that a guilty person will be more likely to crack under such tactics than would an innocent person.<sup>234</sup> The studies performed by social scientists, however, demonstrate that certain personality and intelligence traits of the accused, when combined with coercive interrogation tactics by the interrogator, result in false confessions.<sup>235</sup>

The *Hall* court properly limited the defense expert's testimony to the correlation between false confessions and various interrogation techniques and personality factors. The court noted that some of those techniques were used in the defendant's case.<sup>236</sup> The expert could not testify beyond these bounds, i.e., about the defendant's psychological makeup (as the expert was not a clinical psychologist or psychiatrist), about causation—whether the interrogation techniques used caused the defendant to confess falsely—or comment about the details of the post-confession statement (because that was the province of the jury).<sup>237</sup> Thus, the court, although dealing with evidence that did not precisely fit the *Daubert* paradigm for experimental laboratory science, was capable of using the *Daubert* framework to examine the logic behind the proposed testimony and to limit it appropriately in light of its examination.

The use of new technology does not need to confound the court. Faced with deciding if an arousal test commonly used to monitor and treat sex offenders could be used as the basis for demonstrating that the defendant did not possess the characteristics of a pedophile, neither the trial court nor the court of appeals in *United States v. Powers*<sup>238</sup> had any difficulty determining that the methodology developed for treatment purposes could not be used for litigation, because there were no accepted standards for its use as a diagnostic tool, and many incest offenders had a normal reaction to the test (so that it had a high rate of error (in this case, false negatives).<sup>239</sup>

Another court, in *United States v. Lowe*,<sup>240</sup> facing even more impressive technology, a new twist in DNA methodology, also admirably analyzed the technique in light of *Daubert*, this time finding the new technology to be admissible.<sup>241</sup> At issue in *Lowe* was the use of chemiluminescence in place of autoradiography in the detection phase of restriction fragment length polymorphism (RFLP) DNA analysis, in order to produce a clearer image.<sup>242</sup> First, the court reviewed the RFLP methodology in general, as well as its

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234. *Id.*

235. *Id.* at 1203.

236. *Id.* at 1206.

237. *Id.*

238. 59 F.3d 1460 (4th Cir. 1995).

239. *Id.* at 1471.

240. 954 F. Supp. 401 (D. Mass. 1996).

241. *Id.* at 421.

242. *Id.* at 408.

application to the evidence in the case.<sup>243</sup> The court noted that although RFLP analysis was widely accepted as scientifically valid, the change in protocol to chemiluminescence technique required the court to review its testing, error rate, peer review and general acceptance.<sup>244</sup>

Two validation studies, which the court discussed in detail, showed that the new techniques gave substantially similar, but crisper, detection results in population frequencies as had the older autoradiography technique.<sup>245</sup> The court heard detailed testimony with respect to the causes of any variations between the methods, and was able to conclude that there was no significant impact on the reliability of the RFLP testing methodology.<sup>246</sup>

Although error rate is an important factor in determining admissibility, the FBI in *Lowe* had conducted no such studies.<sup>247</sup> Neither laboratory error rate nor blind proficiency tests were available.<sup>248</sup> This might have posed a problem had the defendant not had an opportunity to test the evidence himself.<sup>249</sup> According to the court (citing a report of the National Resource Council), the “wrongly accused person’s best insurance against the possibility of being falsely incriminated is the opportunity to have the testing repeated.”<sup>250</sup> Split samples had been presented to the defendant for analysis, and no contrary results were urged on the court.<sup>251</sup>

The above cases are merely a few of the many examples of courts adhering to the spirit, if not the letter, of the Supreme Court’s mandate. What all these courts have in common is their willingness to use a critical approach when dealing with questions of scientific validity. In applying the *Daubert*

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243. *Id.* at 403-11.

244. *Id.* at 411.

245. *Id.* at 412.

246. *Id.* at 412-13.

247. *Id.* at 414.

248. *Id.* at 414-15.

249. *Id.* at 416. Under a strict *Daubert* analysis, the absence of data showing the error rate for the methodology should have given the court severe misgivings about admissibility. Without knowing the test’s accuracy, assessing its validity is a near impossibility. The problem for the court, however, is that there is no regulation of forensic laboratories, no requirement for any proficiency testing, and virtually no control for bias of the technician, since double-blind studies are simply not done in crime laboratories. See William C. Thompson, *Accepting Lower Standards: The National Research Council’s Second Report on Forensic DNA Evidence*, 37 JURIMETRICS J. 405, 413-14 (1997). In the absence of such requirements, rather than bounce all evidence handled in unregulated forensic laboratories—arguably, a preferable solution—courts generally rely on the defendant’s ability to retest the samples to correct abuses. However misplaced the *Lowe* court’s optimism about retesting as a panacea may have been—and Professor Thompson vigorously opposes the notion—the court was hardly alone in its optimism.

250. *United States v. Lowe*, 954 F. Supp. 410, 416 (quoting NATIONAL RESEARCH COUNCIL, COMMITTEE ON DNA FORENSIC SCIENCE: AN UPDATE, THE EVALUATION OF FORENSIC DNA EVIDENCE 3-11 (1996)).

251. *Id.* Professor Thompson outlines three reasons for doubting that defendant retesting is a panacea for lack of laboratory controls: first, critical samples may be exhausted in testing making retesting impossible; second, samples are frequently mishandled before splitting, so that retesting will not resolve the errors; third, retesting shifts—partially, at least—the burden of proof to the defendant. Thompson, *supra* note 250, at 415-16.

guidelines, these courts examine the explanatory power of the proffered evidence, its logical consistency, its testability, the precision and objectivity of the testing method, and its consistency with accepted theories.<sup>252</sup> To check their own analysis, the courts then turn to peer review and general acceptance. The above examples demonstrate that trial courts can do the required analysis routinely and well.

### B. Categorical Admissibility Changes

In those courts that are taking *Daubert* seriously, there have been a number of notable changes in the kinds of evidence that are being admitted or excluded, demonstrating the potential for beneficial change that *Daubert* presents. Notably, the problems inherent in traditional eyewitness testimony have been explored in a number of jurisdictions and a number of courts have stated expressly that under the right circumstances, eyewitness identification expert testimony is admissible.<sup>253</sup> Polygraph evidence, long considered inherently untrustworthy, has been re-examined in a number of jurisdictions, often at the insistence of the defense.<sup>254</sup> Psychiatric and psychological testimony is being reexamined as a sufficiently reliable body of genuine specialized knowledge in an appropriate case.<sup>255</sup> *Daubert* has been used to analyze issues of child abuse<sup>256</sup> and post-traumatic stress disorder (including failure to act and repressed memories).<sup>257</sup> *Daubert* also has been used to exclude previously admissible testimony lacking empirical basis such as voice identifi-

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252. See Black, *supra* note 131, at 63 (suggesting these as guideposts for scientific validity).

253. United States v. Brien, 59 F.3d 274, 277 (1st Cir. 1995) (noting increased acceptance of expert eyewitness identification testimony); United States v. Rincon, 28 F.3d 921, 926 (9th Cir. 1994) (finding that where eyewitness identification expert's opinion is based upon scientific knowledge which is reliable and helpful to jury it should be admitted); United States v. Stevens, 935 F.2d 1380 (3d Cir. 1991) (reversing in part to admit eyewitness identification expert testimony regarding correlation between confidence and accuracy); United States v. Norwood, 939 F. Supp. 1132 (D.N.J. 1996) (permitting expert to testify on issues of cross-racial identification, weapon-focus, stress, forgetting curve, relation-back phenomena, correlation between confidence and accuracy, suggestiveness of pretrial identification procedures and effect of exposure duration on eyewitness identification); United States v. Jordan, 924 F. Supp. 443, 447 (W.D.N.Y. 1996) (finding expert eyewitness testimony admissible), *aff'd*, 108 F.3d 330 (1997). *But see* United States v. Almador-Galvan, No. 96-10137, 1997 WL 124342, \*2 (9th Cir. Mar. 18, 1997) (upholding exclusion of eyewitness expert testimony because it lacked scientific support).

254. See, e.g., United States v. Posado, 57 F.3d 428, 436 (5th Cir. 1995) (remanding for determination of scientific validity); United States v. Galbreth, 908 F. Supp. 877, 896 (D.N.M. 1995) (finding evidence admissible subject to limitations); United States v. Crumby, 895 F. Supp. 1354, 1365 (D. Ariz. 1995) (same).

255. See, e.g., United States v. Hall, 109 F.3d 1227 (7th Cir. 1996) (holding district court applied incorrect standard in excluding proffered expert testimony regarding defendant's susceptibility to giving false confession).

256. Gier v. Educational Serv. Unit No. 16, 845 F. Supp. 1342, 1349 (D. Neb. 1994) (excluding expert's testimony as unreliable); Borawick v. Shay, 842 F. Supp. 1501, 1508-09 (D. Conn. 1993) (excluding testimony of hypnotically refreshed memory).

257. Shahzade v. Gregory, 923 F. Supp. 286, 290 (D. Mass. 1996) (finding repressed memory testimony admissible); Isely v. Capuchin Province, 877 F. Supp. 1055, 1067 (E.D. Mich. 1995) (holding post-traumatic stress disorder and repressed memory testimony admissible).

cation,<sup>258</sup> mistaken identity testimony by forensic anthropologists,<sup>259</sup> and expert testimony regarding police discipline theory.<sup>260</sup>

### 1. Eyewitness Testimony

Expert testimony on the fallibility of eyewitness identification is an important and recurring issue.<sup>261</sup> Most courts addressing the issue have declined to admit such testimony, both before and after *Daubert*.<sup>262</sup> The reaction of the Eighth Circuit is fairly standard. When the proffered expert testimony relates to the unreliability of adult eyewitness testimony, the Eighth Circuit has found such testimony to be inadmissible, as failing both the reliability and the helpfulness prongs of Rule 702.<sup>263</sup> The Eighth Circuit found itself unable to assess the scientific validity of the proposed expert's testimony where all that had been submitted were the expert's affidavit and two articles on "how to conduct a non-misleading pre-trial lineup" (in a case where no pretrial lineup had been conducted) containing bare citations to other articles without further explanation.<sup>264</sup> More broadly, however, the court ruled that the "evaluation of eyewitness testimony is for the jury alone."<sup>265</sup> The court's concern was that, rather than a general observation about the problems inherent in eyewitness testimony, the expert was proposing to testify about "the inherently untrustworthy manner with which . . . [the eyewitness] . . . identified . . . [the defendant] . . . in court."<sup>266</sup> This, the court held, was an unwarranted intrusion into the jury's domain.<sup>267</sup>

Contrary to the Eighth Circuit's assumptions, however, substantial research has shown that jurors overbelieve eyewitnesses and have difficulty distinguishing accurate from inaccurate eyewitnesses, primarily because they

258. *Virgin Islands v. Sanes*, 57 F.3d 338, 341 (3d Cir. 1995). Voice spectrography offers a prime example of the fallacies which can occur when courts permit a small community of forensic specialists to self-validate the technology. See Kirsch, *supra* note 3, at 221. In 1979 a multidisciplinary team sponsored by the National Academy of Science reviewed the scientific basis of spectrography and found it suspect, particularly when conditions departed from the laboratory situation. *Id.* at 218 n.45.

259. *United States v. Dorsey*, 45 F.3d 809, 812 (4th Cir. 1995).

260. *Berry v. City of Detroit*, 25 F.3d 1342, 1348-53 (6th Cir. 1994).

261. *United States v. Brien*, 59 F.3d 274, 276 (1st Cir. 1995) (declining to exclude expert testimony on identification as matter of law, despite denying its admissibility in particular case before it).

262. See, e.g., *United States v. Almador-Galvan*, No. 96-10137, 1997 WL 124342, at \*2 (9th Cir. Mar. 18, 1997) (upholding district court's conclusion that expert testimony on eyewitness identification inadmissible); *United States v. Purham*, 725 F.2d 450, 454 (8th Cir. 1984) (same); *United States v. Fosher*, 590 F.2d 381, 382 (1st Cir. 1979) (same). But see *United States v. Stevens*, 935 F.2d 1380, 1401 (3d Cir. 1991) (finding, pre-*Daubert*, that it was not harmless error to exclude expert testimony that confidence in eyewitness identification does not necessarily correlate with accuracy).

263. *United States v. Kime*, 99 F.3d 870, 883 (8th Cir. 1996).

264. *Id.*

265. *Id.* at 884.

266. *Id.*

267. *Id.*

miscorrelate witness confidence with accuracy.<sup>268</sup> Studies of proven cases of wrongful conviction indicate that eyewitness errors constitute the largest single factor in wrongful convictions.<sup>269</sup> Recently, twenty-eight convictions—in each of which eyewitness identifications figured—were overturned based on exculpatory DNA evidence.<sup>270</sup>

Cross-examination is overrated as a safeguard against erroneous eyewitness identification. Although witness confidence may be shaken on cross-examination, this does not improve the jury's ability to detect accuracy, and sometimes makes it worse.<sup>271</sup> Even more disturbing are the studies that demonstrate that coaching (such as most witnesses receive from attorneys in preparation for trial) increases the confidence of inaccurate witnesses far more dramatically than it does for accurate witnesses.<sup>272</sup> This obviously has dire implications for the truth-finding mission of the jury.

Moreover, judicial instructions on the error potential in eyewitness identifications do not appear to have any great mitigating effect.<sup>273</sup> Jury decision-making does not seem to improve with judicial instructions regarding conditions affecting eyewitness identification reliability. Despite increased skepticism, mistaken identifications are still validated at the same rate.<sup>274</sup> Educating juries that an eyewitness identification, like most beliefs, is susceptible to social influences such as conformity, compliance, suggestion, commitment, and motivation, is the province of an expert.<sup>275</sup> Because judges, lawyers, and lay jurors all predominantly suffer from the misconception that witness confidence correlates with identification accuracy,<sup>276</sup> this may be an area in which an expert actually can be helpful to the jury.

Eyewitness expert testimony typically focuses on how the process of memory, perception, and retrieval of information work in general, and how the specific circumstances surrounding an identification may have affected its

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268. Steven Penrod & Brian Cutler, *Witness Confidence and Witness Accuracy: Assessing Their Forensic Relation*, 1 *PSYCHOL. PUB. POL'Y & L.* 817, 830 (1995).

269. Arye Rattner, *Convicted But Innocent: Wrongful Conviction and the Criminal Justice System*, 12 *LAW AND HUM. BEHAV.* 283, 291 (1988). In one study of 1000 cases, for example, eyewitness errors constituted the largest single factor in wrongful convictions. Daniel Coleman, *Studies Point to Flaws in Lineups of Suspects*, *N.Y. TIMES*, Jan. 17, 1995, at C1; see also Jack B. Weinstein, *Book Review*, 81 *COLUM. L. REV.* 441 (1991) (reviewing ELIZABETH F. LOFTUS, *EYEWITNESS TESTIMONY* (1979), which cites studies of wrongful convictions based on faulty eyewitness testimony).

270. 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, 477 (1997).

271. Michael R. Leippe, *The Case for Expert Testimony About Eyewitness Memory*, 1 *PSYCHOL. PUB. POL'Y & L.* 909, 923 (1995).

272. G. Wells et al., *The Tractability of Eyewitness Confidence and its Implications for Triers of Fact*, 66 *J. APPLIED PSYCHOL.* 688, 693-94 (1981).

273. E. Greene, *Judge's Instruction on Eyewitness Testimony: Evaluation and Revision*, 18 *J. APPLIED SOC. PSYCHOL.* 252-76 (1988).

274. Penrod & Cutler, *supra* note 269, at 834.

275. Leippe, *supra* note 272, at 929.

276. Penrod & Cutler, *supra* note 269, at 817-19.



accuracy.<sup>277</sup> The Third Circuit admitted such eyewitness identification testimony even before *Daubert*, finding that "under certain circumstances, expert testimony on the reliability of eyewitness identifications can assist the jury in reaching a correct decision and therefore may meet the helpfulness requirement of Rule 702."<sup>278</sup> More recently, in *United States v. Stevens*,<sup>279</sup> Judge Becker, writing for the Third Circuit, held the district court had abused its discretion in barring testimony on the confidence/accuracy factor of eyewitness identification.<sup>280</sup> Gradually, some of the federal district courts are catching on, finding testimony in the area of human memory and perception to be based on scientific knowledge.<sup>281</sup>

Some state courts also are using the *Daubert* analysis to find expert eyewitness testimony reliable. In *Jordan v. State*,<sup>282</sup> the Texas Court of Criminal Appeals remanded for application of a *Daubert* validity analysis a case in which the primary disputed issue was the eyewitness identification of one of the robbers.<sup>283</sup> Responding to arguments that the expert's testimony would not be helpful because the subject matter was within the common knowledge of the jurors, the court said the testimony could be helpful by either validating or calling into question the jurors' inclinations.<sup>284</sup> It also disagreed with the lower court's finding that cross-examination of the eyewitness would provide the jury with the same information.<sup>285</sup>

## 2. Psychology and Social Science Evidence

Psychological and sociological evidence, at least in some jurisdictions, also is being subjected to *Daubert* analysis. The argument over applying *Daubert* standards to such "soft" sciences centers around whether they should be considered science at all.<sup>286</sup> Nonetheless, in *United States v. Rouse*,

277. Christopher M. Walters, Comment, *Admission of Expert Testimony on Eyewitness Identification*, 73 CAL. L. REV. 1402, 1407 (1985).

278. *United States v. Downing*, 753 F.2d 1224, 1231 (3d Cir. 1985). The Supreme Court in *Daubert* quoted liberally from Judge Becker's *Downing* opinion, concerning the scientific validity assessment. See *Daubert v. Merrell Dow Pharms., Inc.*, 509 U.S. 579, 590, 594 (1993). On remand, however, the trial court remained unpersuaded that the expert would be helpful to the jury. *Downing*, 609 F. Supp. 784 (E.D. Pa.), *aff'd*, 780 F.2d 1017 (3d Cir. 1985).

279. 935 F.2d 1380 (3d Cir. 1991).

280. *Id.* at 1400-01.

281. See *United States v. Jordan*, 924 F. Supp. 443, 447-49 (W.D. N.Y. 1996), *aff'd*, 108 F.3d 330 (2d Cir. 1997); *United States v. Norwood*, 939 F. Supp. 1132, 1136 (D.N.J. 1996) (relying heavily on *United States v. Downing*, 753 F.2d 1224 (3d Cir. 1985), as well as *Daubert*, in determining expert eyewitness testimony to be scientifically valid).

282. 928 S.W.2d 550 (Tex. Crim. App. 1996).

283. *Id.* at 555.

284. *Id.* at 556.

285. *Id.* A Texas trial court reversed itself in light of *United States v. Jordan*, finding the expert eyewitness testimony it had previously excluded to be sufficiently reliable to be admitted. *Nations v. State*, 944 S.W.2d 795, 799 (Tex. Crim. App. 1997).

286. See, e.g., Allen, *supra* note 132, at 1172 (explaining that Karl Popper's notion of falsifiability endorsed by Supreme Court was originally an argument to discredit psychiatric "science" of Sigmund Freud and economic "science" of Karl Marx); Faigman, *supra* note 93, at 1039-

the Eighth Circuit, acknowledging that application of *Daubert* to the social sciences is problematic, held that the defendants had "fulfilled the requirements of *Daubert*."<sup>287</sup> It found that testimony concerning child witnesses and their susceptibility to faulty memory should not have been barred when its purpose was to show that the investigative means employed in the case were consistent with the psychological studies that similar techniques operated suggestively on young children.<sup>288</sup> The district court had erred in summarily rejecting the testimony as "not the sort even contemplated by *Daubert*."<sup>289</sup> The appellate court reviewed the literature, the proposed testimony and the interview practices at issue, and, reversing the district court's exclusion of the evidence, found the testimony admissible.<sup>290</sup> On rehearing, however, the Eighth Circuit found the district court's exclusion of the evidence to have been harmless error.<sup>291</sup>

Nonetheless, an increasing number of jurisdictions are turning to the admissibility criteria of *Daubert* for resolution of admissibility questions regarding the social sciences and psychological evidence. Expert testimony on post-traumatic stress disorder and repressed memory has been found admissible under *Daubert*.<sup>292</sup> For example, the New Mexico Supreme Court applied *Daubert* criteria to admit testimony regarding the diagnosis of post-traumatic stress disorder in the victims of sexual abuse.<sup>293</sup> There, the experts were permitted to testify that a victim's symptoms were consistent with post-traumatic stress disorder.<sup>294</sup> Adding to the cacophony, other courts have applied the *Daubert* criteria to the same sort of evidence and found that it did not meet the standard for scientific validity.<sup>295</sup>

51 (discussing fact that courts should be aware of limitations of social sciences with respect to scientific method); Teresa S. Renaker, Comment, *Evidentiary Legerdemain: Deciding When Daubert Should Apply to Social Science Evidence*, 84 CAL. L. REV. 1657, 1664-68 (1996) (arguing that such testimony functions more as specialized knowledge and should be evaluated not as science, but by assessing its helpfulness to jury).

287. *United States v. Rouse*, 100 F.3d 560, 569 (8th Cir. 1996), *vacated by reh'g en banc*, 111 F.3d 561 (8th Cir. 1997); *see also* *Rincon v. United States*, 510 U.S. 801, 801 (1993) (remanding for reconsideration in light of *Daubert* where expert testimony about eyewitness testimony was at issue).

288. *Rouse*, 100 F.3d at 567-69. Of course, expert testimony concerning the suggestibility child witnesses is not automatically admissible under *Daubert*. It still must meet the test of relevance. *See* *United States v. Reynolds*, 77 F.3d 253, 255 (8th Cir. 1996) (excluding expert testimony because child witness had not been interviewed and therefore was not subjected to faulty techniques).

289. *Rouse*, 100 F.3d at 569.

290. *Id.* at 573.

291. *Rouse*, 111 F.3d at 561.

292. *Isely v. Capuchin Province*, 877 F. Supp. 1055, 1057-67 (E.D. Mich. 1995).

293. *State v. Alberico*, 861 P.2d 192, 202-03 (N.M. 1993).

294. *Id.* at 210.

295. *See* *Gier v. Educational Serv. Unit No. 16*, 845 F. Supp. 1342, 1353 (D. Neb. 1994) (holding, in civil case, that plaintiffs failed to demonstrate reliability of experts' psychological methodologies); *State v. Cressey*, 628 A.2d 696, 701-02 (N.H. 1993) (reversing conviction where psychologist had testified that victims' symptoms were consistent with those of sexually abused children because such vague symptomology was not scientifically valid).

### 3. Polygraph Evidence

Under *Daubert*, at least under certain conditions, longstanding per se rules excluding polygraph evidence appear to be loosening.<sup>296</sup> Although the Supreme Court's post-*Daubert* decision in *United States v. Scheffer*<sup>297</sup> upheld the constitutionality of a per se rule against the admission of polygraph evidence in court-martial proceedings, it did so on the basis of the current unreliability of such tests, leaving open the possibility of differing conclusions among the individual district courts.<sup>298</sup> The Fifth Circuit has rejected its earlier denial position,<sup>299</sup> and district courts in the Ninth and Tenth Circuits have admitted polygraph evidence proffered by the defense as exculpatory evidence.<sup>300</sup> Polygraph testing, intended to measure and record physiological responses to stress (supposedly induced by fear of deception), has been refined considerably since its origins at the beginning of this century.<sup>301</sup> For example, in *United States v. Posado*,<sup>302</sup> the Fifth Circuit noted advances in instrumentation and technique, and—while excluding the proffered polygraph evidence in the case before it—found such evidence would not be per se inadmissible under *Daubert*.<sup>303</sup>

Nonetheless, polygraph accuracy remains debatable, and at least ten percent of the population is simply untestable.<sup>304</sup> Courts have differed widely in determining the admissibility of such tests. Polygraph examination results were found admissible under *Daubert* in a criminal tax evasion action in the District of New Mexico<sup>305</sup> and in a robbery trial in the District of Arizona.<sup>306</sup> In the robbery trial, the court limited the testimony to preclude admission of specific questions and responses, permitting testimony only to the fact that the defendant took and passed the polygraph test and to the validity of the examination.<sup>307</sup> The Sixth Circuit<sup>308</sup> and the Southern District of New

296. *Frye* itself was a polygraph case, in which the District of Columbia Circuit Court held polygraph evidence inadmissible because the theory and techniques had not met with general acceptance in the scientific community. *Frye v. United States*, 293 F. 1013, 1014 (D.C. Cir. 1923). Although the predominant result before *Daubert* was exclusion, a few courts found polygraph evidence to be admissible. See *United States v. Ridling*, 350 F. Supp. 90 (E.D. Mich. 1972); *United States v. Hart*, 344 F. Supp. 522 (E.D.N.Y. 1971).

297. No. 96-1133, 1998 WL 141151 (Mar. 31, 1998).

298. *Id.* at \*5.

299. See *United States v. Posado*, 57 F.3d 428, 434 (5th Cir. 1995) (holding polygraph evidence no longer would be per se inadmissible for any purpose).

300. See *United States v. Galbreth*, 908 F. Supp. 877, 895 (D.N.M. 1995) (admitting results of polygraph test in defense of willful income tax evasion); *United States v. Crumby*, 895 F. Supp. 1354, 1364-65 (D. Ariz. 1995) (allowing use of polygraph evidence in defense of bank robbery charge).

301. Kesan, *supra* note 136, at 2014.

302. 57 F.3d 428 (5th Cir. 1995).

303. *Id.* at 434.

304. Experts believe that at least 10% of the population can fool even a properly administered test. Kesan, *supra* note 136, at 2015.

305. See *Galbreth*, 908 F. Supp. at 895.

306. See *United States v. Crumby*, 895 F. Supp. 1354, 1364-65 (D. Ariz. 1995).

307. *Id.* at 1363-64.

York<sup>309</sup> bypassed Rule 702 analysis entirely and instead opted to exclude polygraph evidence under Rule 403 as misleading and confusing to the jury.

#### 4. Other Forensic Identification Evidence: A Mixed Bag

In other areas, the results have been mixed and the courts are in frequent disagreement over the same kinds of evidence. There are certainly instances in which *Daubert* has kept out shaky evidence. For example, *Daubert* analysis has been used to exclude testimony based on the use of the penile plethysmograph, which purportedly measures sexual response to visual stimulation.<sup>310</sup> Voice identification also has failed the scientifically valid prong of *Daubert*.<sup>311</sup>

On the other hand, a number of highly questionable techniques continue to find widespread currency in criminal cases. Some courts are letting in evidence which they concede cannot meet the *Daubert* standard, by categorizing it as “technical” rather than “scientific.”<sup>312</sup> Handwriting analysis, for example, failed to meet the *Daubert* test in the Southern District of New York, although the reviewing court nonetheless admitted it as technical expertise.<sup>313</sup> The Sixth Circuit similarly decided that even though handwriting analysis could not meet the test for scientific knowledge, its exclusion was not required. The court cited a case from the District of Columbia Circuit for the proposition that handwriting expertise “can be judicially noted” because such evidence “like fingerprints, are subject to established objective tests.”<sup>314</sup> A third court found handwriting admissible under *Daubert* as long as it was applied evenhandedly to both the government and defense experts.<sup>315</sup>

Hair identification, which generally long has been admissible in criminal prosecutions,<sup>316</sup> continues to be admissible, despite numerous studies show-

308. See *Conti v. Commissioner*, 39 F.3d 658, 662 (6th Cir. 1994) (finding that prejudicial effect of polygraph results outweighed probative value under Federal Rule of Evidence 403).

309. See *United States v. Lech*, 895 F. Supp. 582, 585 (S.D.N.Y. 1995) (stating that polygraph answers likely would mislead or confuse jury).

310. See *United States v. Powers*, 59 F.3d 1460, 1471 (4th Cir. 1995) (affirming district court’s exclusion of penile plethysmograph evidence).

311. See *Virgin Islands v. Sanes*, 57 F.3d 338, 341 (3d Cir. 1995) (affirming district court’s exclusion of voice spectrography evidence); see also Kirsch, *supra* note 3, at 221-22 (1995) (stating that courts often inappropriately rely on the founders or initial proponents of technology in question); see *supra* note 259.

312. See *supra* notes 55-82 and accompanying text for a discussion of the “technical” versus “scientific” debate.

313. See *United States v. Starzeczyzel*, 880 F. Supp. 1027, 1038 (S.D.N.Y. 1995) (holding that although handwriting analysis could not meet the *Daubert* standards, it was still admissible because *Daubert* does not apply to technical evidence).

314. *United States v. Jones*, 107 F.3d 1147, 1159 (6th Cir. 1997) (citing *Greenberg Gallery, Inc. v. Bauman*, 817 F. Supp. 167, 172 n.5 (D.D.C. 1993), *aff’d*, 36 F.3d 127 (D.C. Cir. 1994)).

315. See *United States v. Velasquez*, 64 F.3d 844, 848-50 (3d Cir. 1995) (applying same Rule 702 standards to government and defense expert witnesses on handwriting).

316. See Edward J. Imwinkelried, *Forensic Hair Analysis: The Case Against the Underemployment of Scientific Evidence*, 39 WASH. & LEE L. REV. 41, 62 (1982) (observing that the

ing the inadequacy of the currently available techniques.<sup>317</sup> The subjectivity and statistical unbelievability of the number of asserted comparisons appear to be the principal problems with the methodology.<sup>318</sup> Indeed, even the progenitor of hair analysis techniques, B.D. Gaudette, has expressed doubts about its objectivity.<sup>319</sup>

Bullet identification evidence also has survived *Daubert* in spite of its questionable scientific basis. For example, in *United States v. Davis*,<sup>320</sup> such evidence was admitted despite the expert's concession that he had no way of knowing how many other bullets produced in the same factory on the same day as those he tested and identified as being from the same box in defendant's possession had the same elemental composition.<sup>321</sup> The Eighth Circuit upheld the expert's identification procedure as scientifically valid anyway, finding all four of the *Daubert* factors to be present: general acceptance, testability, publication, and peer review.<sup>322</sup> Contrary to this finding, bullet identification techniques have been widely scorned as subjective determinations lacking in scientific basis.<sup>323</sup>

Another post-*Daubert* court successfully circumvented any logical analysis of expert photogrammetry evidence that purported to be able to estimate the height of an individual in a bank robbery photograph by comparing it to the dimensions of other known objects in the photograph.<sup>324</sup> The court sim-

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"massive body of case law, liberally admitting even hair evidence of low probative value, dwarfs the handful of cases excluding hair evidence").

317. See Clive A. Stafford Smith & Patrick D. Goodman, *Forensic Hair Comparison Analysis: Nineteenth Century Science or Twentieth Century Snake Oil?*, 27 COLUM. HUM. RTS. L. REV. 227, 227 (1996) (noting that limited empirical studies concerning human hair comparisons reveal more questions than answers).

318. FINKELSTEIN & LEVIN, *supra* note 107, at 481 (criticizing sharply hair comparison techniques).

319. B. D. Gaudette, *Some Further Thoughts on Probabilities and Human Hair Comparisons*, 23 J. FORENSIC SCI. 758, 759 (1978) (noting that hair comparison is somewhat subjective). Firearms identification is a similar example of an essentially subjective technique, which, though based on apparently objective criteria such as striation marks on a bullet, depends on the subjective judgment of the technician, making the individual technician's error rate an important issue in the testimony's validity. See Paul C. Giannelli, *The Twenty-First Annual Kenneth T. Hodson Lecture: Scientific Evidence in Criminal Prosecutions*, 137 MIL. L. REV. 167, 184 (1992) (noting that the greater a forensic technique's subjectivity, the greater the possibility of error).

320. 103 F.3d 660 (8th Cir. 1996).

321. *Id.* at 674 (8th Cir. 1996); see also Saks & Koehler, *supra* note 10, at 368 n.28 (explaining that identification ability of firearms evidence, as well as that of most forensic sciences, has never been demonstrated).

322. *Davis*, 105 F.3d at 673-74. The problem here, however, may have been an inadequate challenge, because the defense merely read a single critical paragraph from a book. *Id.* at 674. Perhaps if defense counsel had an expert who could have explained the significance of this factor in a scientific validity determination, it might have fared better.

323. See, e.g., ANDRE A. MOENSSENS & FRED E. INBAU, *SCIENTIFIC EVIDENCE IN CRIMINAL CASES* 458 (2d ed. 1978) (explaining that neutron activation bullet analysis is fundamentally suspect because it is subject to human contamination); Giannelli, *supra* note 317, at 183 (noting that although based on objective data such as striation markings, bullet identification techniques ultimately rest on subjective judgment of examiner).

324. *United States v. Quinn*, 18 F.3d 1461, 1464-65 (9th Cir. 1994).

ply affirmed admission of it as technical expertise, similar to computer-assisted calculations.<sup>325</sup> In a more rational decision, the Fourth Circuit, presented with the same kind of evidence, excluded the forensic anthropologist's testimony because the methodology was not tested, had not been subject to peer review, was not generally accepted in the relevant scientific community, and had a high rate of error.<sup>326</sup>

There does not appear to be any general consensus among the courts on these oft-used tools for criminal prosecutions. Those courts which take *Daubert* seriously frequently find themselves unable to admit evidence based on prevalent forensic techniques. Frightened by such a prospect, other courts attempt to evade the issue by categorizing evidence as "technical" and therefore not required to meet the standards for scientific knowledge. Such evasion of their judicial responsibilities undermines the judicial system.

### C. Increased Scrutiny of Forensic Practice and Procedure

Despite the significant role forensic evidence plays in criminal trials, there is no mandatory regulation of forensic laboratories.<sup>327</sup> The laboratories of the Federal Bureau of Investigation—through which passes the forensic evidence for some of our major national cases—are not even accredited.<sup>328</sup> Shocking but true: "clinical laboratories must meet higher standards to be allowed to diagnose strep throat than forensic labs must meet to put a defendant on death row."<sup>329</sup> Forensic laboratories are subject to no mandatory external review process.<sup>330</sup> As a result, questionable evidence resulting from slipshod practices and substandard procedures has been presented by the prosecution in hundreds of cases, all too frequently with consequent convictions.<sup>331</sup> For example, when the Forensic Science Founda-

325. *Id.* at 1465.

326. *United States v. Dorsey*, 45 F.3d 809, 814-15 (4th Cir.), *cert. denied*, 515 U.S. 1168 (1995).

327. Giannelli, *supra* note 271, at 474.

328. In 1994, FBI Laboratory Director Louis Freeh announced that the laboratory would pursue accreditation by the American Society of Crime Laboratory Directors/ Laboratory Accreditation Board "at the earliest possible time." FBI LABS REPORT, *supra* note 18, at 22. To date, the lab has not received its accreditation.

329. Eric S. Lander, *DNA Fingerprinting on Trial*, 339 NATURE 501, 505 (June 15, 1989). Clinical laboratories have been federally regulated since Congress passed the Clinical Laboratory Improvement Amendments of 1988, Pub. L. No. 100-578, 102 Stat. 2903 (1988) (amending 42 U.S.C. § 263a).

330. Giannelli, *supra* note 271, at 473. The National Academy of Science has recognized the problem in its report on DNA testing, acknowledging that "[p]rofile testing and audits are key assessment mechanisms in any program for critical self-evaluation of laboratory performance." NATIONAL RESEARCH COUNCIL, THE EVALUATION OF FORENSIC DNA EVIDENCE 78 (1996).

331. *See In re Investigation of the W. Va. State Police Crime Lab, Serology Div.*, 438 S.E.2d 501, 511-17 (W.Va. 1993) (noting systemic deficiencies in state crime lab including failure to require written protocol, failure to follow generally recognized testing standards, absence of quality control or proficiency testing); Marcia Coyle, *Expert Under Fire in Capital Cases*, NAT'L L.J., July 11, 1994, at A1 (reporting on bogus testimony of forensic dentist testifying about tool

tion sent samples of hair, blood, bullets, and paint chips to over two hundred police laboratories in the United States and Canada, 71% misidentified the blood sample, 50% failed to identify the hair sample as dog hairs, 34% failed to match paint chips, and 88 laboratories tried to match .22 caliber bullets from two different weapons.<sup>332</sup> A pre-*Daubert* survey conducted under the auspices of the American Academy of Forensic Sciences identified competency as the most significant ethical problem in the field, together with the failure of forensic scientists to express the strengths and weaknesses of their data, giving opinions exceeding the limits of their data and failure to remain objective in evaluating evidence and giving testimony.<sup>333</sup> The recent investigation into the FBI forensic laboratories reveals significant instances of substandard work,<sup>334</sup> inadequate laboratory training and deficient knowledge,<sup>335</sup> tailoring testimony in favor of the prosecution,<sup>336</sup> and failures to present objective reports.<sup>337</sup>

These problems remain of great concern today.<sup>338</sup> The Department of Justice has investigated the FBI laboratories and found them wanting.<sup>339</sup> It directed major changes to take place, including the development of written protocols, increased training, improved standards, quality control, and increased supervision of expert testimony.<sup>340</sup> The Report further recognized that "for the . . . Laboratory to have wide-ranging credibility in courts and in the forensic community, examiners must strictly adhere to established protocols for the analysis of evidence or document the reasons for departing from

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marks, shoeprints, fingernail comparisons, knife-wound comparisons in which he used unfounded and unreproducible lighting technique to make identifications); Hansen, *supra* note 76, at 64-65 (debunking the work of forensic anthropologist Louise Robbins, who claimed ability to identify person who made particular footprint by examining any other shoes belonging to that individual—a scientifically unexplained feat no one else could reproduce). See generally Giannelli, *supra* note 271, at 441 (detailing abuses in use of scientific evidence, including perjury by expert witnesses, faked laboratory reports, and testimony based on unproven techniques).

332. Moenssens, *supra* note 27, at 561 (concluding that appalling number of laboratories reported erroneous results); see also Michael J. Saks, *Accuracy v. Advocacy: Expert Testimony Before the Bench*, 90 *TECH. REV.* 42, 47 (Aug.-Sept. 1987) (referencing the National Institute of Justice's study showing varying levels of lab competency).

333. Giannelli, *supra* note 318, at 178 & n.57 (citing Joseph L. Peterson & John E. Murdock, *Forensic Sciences Ethics: Developing an Integrated System of Support and Enforcement*, 34 *J. FORENSIC SCI.* 749, 751 (1989)); see also Michael J. Saks, *Prevalence and Impact of Ethical Problems in Forensic Science*, 34 *J. FORENSIC SCI.* 772, 775-78 (1989) (discussing proficiency testing and concluding that "errors are indeed made and that there is a wide range of interlaboratory variation").

334. FBI LABS REPORT, *supra* note 18, at 2.

335. *Id.* at 13.

336. *Id.* at 10 (detailing the testimony given by the FBI expert in the World Trade Center bombing case, *United States v. Salameh*, No. S5-93, 1993 WL 364486 (S.D.N.Y. Sept. 15, 1993), in which the explosives expert gave opinions based on invalid inference, an incomplete statement, and invalid and misleading statements about the types of explosives, so that his opinion was mere speculation based on evidence linking the defendants to that explosive).

337. *Id.* at 14.

338. *Id.* at 1.

339. *Id.* at 1 (Executive Summary).

340. *Id.*

them. The same is true for the handling of evidence and the adoption of measures to prevent and detect contamination."<sup>341</sup> These pervasive problems with forensic evidence have been acknowledged, at least with respect to DNA evidence, in the passage of the 1994 DNA Identification Act,<sup>342</sup> which requires that laboratories receiving federal funding submit to proficiency testing. Thus scientific validity requires proficiency testing and the maintenance of high laboratory standards, a factor recognized by the Supreme Court when it included the error rate as a reliability guideline under *Daubert*.<sup>343</sup>

### CONCLUSION

In *Daubert*, the Supreme Court explicitly directed the trial judge to consider error rate and proficiency testing when considering the admissibility of scientific evidence.<sup>344</sup> The inability of identification technique evidence to meet these tests should preclude its admissibility. Moreover, until such purportedly scientific evidence can justify itself on scientific grounds, it ought to be excluded. Indeed, by insisting that evidence used in criminal trials have a scientifically valid basis before it may be admitted, courts can play a major role in advancing the quality and reliability of the fact-finding process. In this regard, *Daubert* presents a great opportunity to improve the quality of criminal jurisprudence. Courts that continue to admit forensic evidence that cannot justify itself on scientific grounds under the rubric of "technical" evidence, or by taking judicial notice of its long admissibility history are not only misreading *Daubert*, but are impeding much-needed reforms in forensic laboratories.

Nevertheless, *Daubert* has caused a profound change in the rhetoric of judicial analysis and has focused the law on the necessity of a test for the admissibility of scientific evidence that considers the evidence itself and not merely the conclusions of a witness. Courts must now at least go through the motions of examining the scientific validity of proffered evidence. Obviously, some courts are more adept at the required analysis than others,<sup>345</sup> and some courts are notably recalcitrant in performing it at all. Nonetheless, the level of the debate has changed. No longer is it enough to obtain the approval of a cohort of the expert's cronies willing to vouch for the technique. At the very least, *Daubert* has focused attention on the importance of examining the underlying theory and technique rather than just the proffered conclusion.

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341. *Id.* at 24-25 (concluding that the "process of managing necessary changes will be challenging in an environment in which scientific knowledge is expanding and forensic science is increasingly under scrutiny").

342. Pub. L. No. 103-322, 108 Stat. 1796 (1994).

343. *Daubert v. Merrell Dow Pharms., Inc.*, 509 U.S. 579, 594 (1993) (stating the "court ordinarily should consider the known or potential rate of error . . . and the existence and maintenance of standards controlling the technique's operation") (citations omitted).

344. *Id.*

345. *See, e.g., In re Paoli R.R. Yard PCB Litig.*, 35 F.3d 717, 763-65 (3d Cir. 1994) (utilizing a thorough *Daubert* analysis in the civil context).



Moreover, the Supreme Court has made it explicit that examining the logical basis of expert reasoning is what judges should be doing when they make the admissibility decision, rather than merely polling professional opinion.

Some critics contend that *Daubert* has changed little about the way courts handle scientific evidence other than changing the label.<sup>346</sup> Certainly, far too many criminal courts are evading their *Daubert* duties. However, such criticism fails to take into account the changes criminal laboratories are already beginning to undertake as a result of the increased scrutiny of laboratory protocols and techniques.<sup>347</sup> In addition, the scientific validity of previously accepted identification techniques is now being challenged with some success.<sup>348</sup> Absent the heightened scrutiny required under *Daubert*, it is doubtful such changes would be feasible.

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346. See, e.g., Thomas J. Mack, *Scientific Testimony After Daubert: Some Early Returns From Lower Courts*, TRIAL, Aug. 1994, at 23-24 (noting that courts have had little difficulty shifting the analysis from general acceptance to scientific validity with no change in results).

347. The shakeup in the laboratories of the Federal Bureau of Investigations, for example, although the result of a whistleblower's allegations rather than court proceedings, has caused the reopening of many criminal cases and the renewed focus on laboratory procedures and practices. See generally Ruth Larson, *Serious Deficiencies Plague FBI Crime Labs, Errors Affect Bombings, Other Cases*, WASH. TIMES, Apr. 16, 1997, at A1 (detailing results of probe concerning FBI laboratory procedures and practices).

348. See Bernstein, *supra* note 14, at 137-38 (observing that post-*Daubert* courts are more inclined to give closer scrutiny to expert scientific testimony).