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§7.7 Reliability Standard (Daubert, Frye)

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§7.7 Reliability Standard (*Daubert*, *Frye*)

In its decision in the *Daubert* case in 1993, the Supreme Court announced a new standard that brought about what amounts to a sea change in the approach to scientific evidence. Oversimplifying for a moment, the Court held that such evidence must satisfy a “reliability” standard in order to be admissible. In *Kumho Tire* four years later, the Court held that *Daubert* applies to *all* expert testimony, not just to testimony that can be called scientific.¹ Capping off these developments, Rule 702 was amended in 2000 by the addition of three numbered clauses directing courts to consider whether the expert (1) has “sufficient facts or data” underlying the testimony, (2) applied “reliable principles and methods,” and (3) “applied the principles and methods reliably to the facts” of the case.²

Outline of discussion

The ensuing discussion begins with *Daubert*, focusing on the message and approach, and then on specific points that constitute the *Daubert* standard. Then we turn to the requirements set out in the amended Rule. Then this section discusses the problem of applying *Daubert* to experiential expertise and other forms of expert testimony that do not seem scientific in the usual sense. Next this section takes up procedural issues, focusing first on how courts resolve *Daubert* issues and on burdens, and then on scope of review. Finally, this section considers problems of integrating scientific and technical proof into the legal system. This section does not discuss the myriad issues specific to the common forms of scientific and technical evidence. These matters have generated full treatises devoted specifically to that subject.³ As befits an epic case, *Daubert* has inspired a vast scholarly output, as well as newsletters and databanks devoted specifically to the problems of applying the case in specific situations.⁴

§7.7 1. *Daubert v. Merrell Dow Pharmaceuticals, Inc.*, 509 U.S. 579 (1993) (scientific evidence must be reliable and must fit case, but can be excluded under FRE 403); *Kumho Tire Co. v. Carmichael*, 526 U.S. 137, 147 (1999) (in referring to “scientific” and to “technical” and “other specialized” knowledge, FRE 702 draws no distinctions; *Daubert* applies equally to all three, and to “experiential” expertise).

2. As a result of the restyling amendments in 2011, these clauses are now numbered (b), (c), and (d) and the wording is slightly changed, but without any change in meaning.

3. This work cannot cover scientific evidence in detail. Modern treatises provide admirable accounts. See Faigman, Kaye, Saks & Sanders, *Modern Scientific Evidence* (2d ed. 2002) (4 vols.); Giannelli & Imwinkelried, *Scientific Evidence* (3d ed. 1999) (3 vols.); Moenssens, Starrs, Henderson & Inbau, *Scientific Evidence in Civil and Criminal Cases* (4th ed. 1995) (forensic science).

4. Here are a few of the many useful discussions: Fenner, *The Daubert Handbook: The Case, Its Essential Dilemma, and Its Progeny*, 29 Creighton L. Rev. 939 (1996); Graham, *Expert Witness Predicament: Determining “Reliable” Under the Gatekeeping Test of Daubert, Kumho, and Proposed Amended Rule 702 of the Federal Rules of Evidence*, 54 U. Minn. L. Rev. 317 (2000); Imwinkelried, *Evaluating the Reliability of Nonscientific Expert Testimony: A Partial Answer to the Questions Left Unresolved by Kumho Tire Co. v. Carmichael*, 52 Me. L. Rev.

The *Daubert* case

Before *Daubert*, most courts followed the *Frye* standard, under which scientific evidence could be admitted only if it had attained “general acceptance” in the relevant scientific community.⁵ In contrast, *Daubert* held that federal courts applying FRE 702 should consider multiple factors (including error rates and existence of standards) in assessing reliability. In net effect, *Daubert* tells courts to look closely and directly at the evidence and to consider a wide range of factors bearing on reliability, and in these ways *Daubert* rejects *Frye*. The crux of it is that courts act as gatekeepers when it comes to scientific (and now technical) evidence.⁶ Yet *Daubert* includes, in its list of relevant considerations, the one factor that *Frye* deemed all-important (general acceptance), and the *Frye* standard also lives on in a more than a dozen states.

Daubert actually takes a three-pronged approach: Courts are to consider the “validity” or “reliability” of the evidence in question, its degree of “fit” with the facts and issues in the case, and the risks or dangers that the evidence will confuse the issues or mislead the jury (the concerns embodied in FRE 403). All three of these factors are important, and each can prove critical in any given case, but it is the reliability standard that presents by far the greatest challenge.

Three additional points merit stress at the outset.

(1) Confront reliability directly

First, *Daubert* does not let courts admit or exclude scientific evidence on the basis of simple tests. On the one hand, *Daubert* commissions courts to confront the reliability of science directly, and rejects the notion that merely qualifying an expert paves the way for whatever he might want to contribute.⁷ On the other hand, *Daubert* also rejects the notion that scientific or technical

19 (2000); Imwinkelried, The Taxonomy of Testimony Post-Kumho: Refocusing on the Bottomlines of Reliability and Necessity, 30 Cumb. L. Rev. 185 (2000); Risinger, Preliminary Thoughts on a Functional Taxonomy of Expertise for the Post-Kumho World, in 1 Modern Scientific Evidence (Faigman, Kaye, Saks & Sanders eds., 2002); Risinger, Navigating Expert Reliability: Are Criminal Standards of Certainty Being Left on the Dock? 64 Alb. L. Rev. 99 (2000); Slobogin, Psychiatric Evidence in Criminal Trials: To Junk or Not To Junk, 40 Wm. & Mary L. Rev. 1 (1998); Slobogin, Doubts About Daubert: Psychiatric Anecdotes as a Case Study, 57 Wash. & Lee L. Rev. 919 (2000).

5. *Frye v. United States*, 293 F. 1013 (D.C. Cir. 1923) (excluding polygraph because it had not attained “general acceptance” in its field).

6. *Smith v. Jenkins*, 732 F.3d 51, 65 (1st Cir. 2013) (absence of findings on the record left reviewing court “hard-pressed to conclude” that trial court “adequately fulfilled its gatekeeping role”) (remanding with instruction to revisit *Daubert* issue); *Dodge v. Cotter Corp.*, 328 F.3d 1212, 1222 (10th Cir. 2003) (*Daubert* requires courts to exercise gatekeeping responsibility; court faced “exceedingly difficult, complex case” and trial court did not make “adequate findings” on record to assure that testimony was reliable and opinions were “based on valid reasoning and reliable methodology”) (reversing).

7. *Valentine v. Conrad*, 850 N.E.2d 683, 687 (Ohio 2006) (experience of “highly qualified” experts does not show legal reliability of opinions); *Fuesting v. Zimmer, Inc.*, 421 F.3d 528, 535-536 (7th Cir. 2005) (cannot rely on

evidence may be excluded simply because it represents a new approach that has not yet been subject to the discipline of professional scrutiny. Hence peer review and publication are not absolutely essential, and evidence developed for purposes of suit, or to analyze some issue or problem, may be admissible. Indeed, *Daubert* means that proponents may sometimes present new conclusions based on old data that have led others to contrary conclusions.⁸ Nevertheless, it does count in the decision on reliability that the expert has reached conclusions that are consonant with those reached by others: If an expert has reached conclusions that are sharply discordant when compared to those reached by similar experts applying similar methods to similar facts, the disparity is a red flag suggesting that something about the method or the manner of application has gone wrong and that the reliability standard has not been satisfied.⁹

(2) Right or wrong is not the question

Second, the *Daubert* standard, buttressed and reinforced by amended FRE 702, does not invite courts to decide that the testimony is right or wrong or to displace the adversary system.¹⁰ That system depends on cross-examination and allowing the other side to offer its own counterproof, and these mechanisms put before the trier of fact the necessary information to make a considered judgment, to decide which side should carry the day.¹¹

(3) Conflicting opinions can pass muster

Third, and correlated with these points, sharply conflicting expert opinions can all pass muster under *Daubert* and amended FRE 702. Accepting the expertise of one witness does not entail

credentials alone).

8. *Daubert v. Merrell Dow Pharmaceuticals, Inc.*, 509 U.S. 579 (1993) (publication is not sine qua non, nor “necessarily correlate” with reliability; new propositions may be “too particular, too new, or of too limited interest to be published”).

9. *General Electric Co. v. Joiner*, 522 U.S. 136, 146 (1997) (“conclusions and methodology are not entirely distinct,” and experts “commonly extrapolate from existing data,” but court need not admit opinion that is “connected to existing data only by the ipse dixit of the expert,” and “may conclude that there is simply too great an analytical gap” between data and opinion).

10. *Daubert v. Merrell Dow Pharmaceuticals, Inc.*, 509 U.S. 579, 590 n.9 & 595 (1993) (should focus “solely on principles and methodology,” not conclusions; the concern is scientific validity, and “evidentiary reliability” rests on “scientific validity”); *Deputy v. Lehman Bros., Inc.*, 345 F.3d 494, 506, 62 Fed. R. Evid. Serv. 965 (7th Cir. 2003) (error to reject testimony on handwriting for reasons of “credibility and persuasiveness,” which are “relevant only in valuing the testimony, not in determining its admissibility”).

11. *United States v. 14.38 Acres of Land Situated in Leflore County, Mississippi*, 80 F.3d 1074, 1078 (5th Cir. 1996) (gatekeeping role does not “serve as a replacement for the adversary system”).

rejecting the expertise of another witness who has come to the opposite conclusion.¹²

The first *Daubert* requirement is that the science be reliable or valid, and courts usually speak of “reliability.” *Daubert* expects judges to decide the question whether the theories, techniques, and data as applied can be trusted. Scientists commonly use this term to describe consistent outcomes, but the concern of lawyers and the system as expressed in *Daubert* is practical and concrete, and what *Daubert* seeks is the best available assurance of reliability in the sense of accurate and correct outcomes.¹³

First factor: Reliability

It bears emphasis that the focus is “the case at hand” (as the Court emphasized in *Kumho Tire*), not the type or form of analysis being offered, and it does not matter whether such analysis can be correct in other settings.¹⁴

Many lines of inquiry are pertinent in applying the reliability standard. *Daubert* provides criteria for guidance, while stressing (as the Court repeated in *Kumho Tire*) that the inquiry is “flexible” and is shaped by the context of the particular case. Courts are to consider (1) whether the theory or technique can be and has been tested, (2) whether it has been subjected to peer review and publication, (3) error rates, (4) the existence of standards governing the operation of the technique, and (5) degree of acceptance in the scientific community, since widespread acceptance is a positive sign and minimal support is a negative sign for a widely known technique.¹⁵

Daubert made it clear that the factors that it cited are exemplary rather than exhaustive. Hence many other factors count as well. The Third Circuit in the *Downing* case, which anticipated

12. See ACN to FRE 702 (ruling that expert testimony is reliable “does not necessarily mean that contradictory expert testimony is unreliable”); *State v. Farner*, 66 S.W.3d 188, 207 (Tenn. 2002) (court “need not weigh or choose between two legitimate but conflicting scientific views”); *Ruiz-Troche v. Pepsi Cola*, 1 F.3d 77, 85 (1st Cir. 1998) (*Daubert* “neither requires nor empowers” courts to decide “which of several competing scientific theories has the best provenance”).

13. *State v. O’Key*, 899 P.2d 663, 678 n.19 (Or. 1995) (validity describes how well scientific method “reasons to its conclusions,” while reliability describes ability of method “to produce consistent results when replicated”). See Faigman, To Have and Have Not: Assessing the Value of Social Science to the Law as Science and as Policy, 38 *Emory L.J.* 1005, n.16 (1989) (in standard usage, validity “refers to the ability of a scientific test to measure what it purports to measure” while reliability refers to ability of test “to obtain consistent results”); Black, A Unified Theory of Scientific Evidence, 56 *Fordham L. Rev.* 595, 599-600 (1988) (reliability means consistency; validity means “based on sound reasoning”).

14. *Kumho Tire Co. v. Carmichael*, 526 U.S. 137, 153-154 (1999) (look at “case at hand,” ask not whether it is reasonable for expert to rely on “visual and tactile inspection” of tire, but whether it was reasonable to take this approach in reaching “conclusion regarding *the particular matter to which the expert testimony was directly relevant*”) (original emphasis).

15. *Daubert v. Merrell Dow Pharmaceuticals*, 509 U.S. 579, 595 (1993) (“flexible” inquiry); *Kumho Tire Co. v. Carmichael*, 526 U.S. 137, 146 (1999) (*Daubert* “should be applied flexibly” and *Daubert* factors are “simply illustrative”) (others count too).

Daubert, cited additional factors that count, including (6) nonjudicial uses and experience with the process or technique, (7) its novelty and relationship to other methods of analysis, (8) the qualifications and professional stature of the expert witness, (9) the types of error experienced, whether likely to favor the offering party or understate what he seeks to prove, and (10) the existence of a body of professional literature appraising the process or technique, which tends to ensure widespread attention and critical scrutiny.¹⁶

In addition to these factors, the ACN accompanying the amendment to FRE 702 in 2000 cited still more factors. Thus courts may consider (11) whether the opinion grows from independent research or was developed for purposes of litigation, (12) whether the expert has unjustifiably extrapolated from an accepted premise to an unfounded conclusion, (13) whether the expert has adequately accounted for alternative explanations, (14) whether the expert has exercised the care appropriate to professional work, and (15) whether the field is known to reach reliable results in the area of the proposed testimony.

It is unnecessary for proffered scientific or technical evidence to satisfy the standards or tests suggested by *all 15* factors listed above. Trial courts have leeway in deciding which factors bear saliently on the proffered evidence, and leeway as well to decide whether those standards or tests are satisfied by the proffered evidence. Where proffered evidence does not satisfy any of these standards, its validity or reliability is not shown and it should be excluded.¹⁷

Second factor: Fit

The degree of “fit” between the proffered testimony and the facts and issues in the case is an aspect of relevancy. Expert testimony usually reflects, and brings to bear on the case, theories, tests, and experience generated in situations unrelated to the events in litigation. Hence its utility turns partly on the degree of resemblance between the transactions in suit and the situations in which the science or expertise was generated. Expert testimony also extrapolates or draws conclusions resting on theories, tests and experience, and its utility turns in part on how closely the conclusion is connected to the underlying data—whether it is but a short step from data to conclusion or a long inferential leap. The closer the connection, the better the fit, although this criterion does not demand that there be a perfect congruence between proffered testimony and facts or issues in the case.¹⁸

Sometimes the question of fit turns on outright conflicts between the facts or assumptions in a

16. *United States v. Downing*, 753 F.2d 1224, 1237-1242 (3d Cir. 1985). *See States v. Baines*, 573 F.3d 979 (10th Cir. 2009) (stressing “overwhelming acceptance” of fingerprinting, court affirms finding of trial judge that such evidence is sufficiently reliable to be admitted, but expresses sympathy with view that more research is desirable).

17. *Cabrera v. Cordis Corp.*, 134 F.3d 1418, 1422-1423 (9th Cir. 1998) (excluding testimony by immunologist who could not say how he reached conclusions or explain test, or show that it had been peer-reviewed; excluding testimony by internist for “lack of supporting research,” peer-reviewed articles, and failure to show he followed method embraced by other experts).

18. *Daubert v. Merrell Dow Pharmaceuticals, Inc.*, 509 U.S. 579 (1993) (evidence must be “sufficiently tied to the facts” to aid jury, aptly described as “fit”); *Guillory v. Domtar Industries Inc.*, 95 F.3d 1320, 1330 (5th Cir. 1996) (excluding testimony by engineer and accident reconstruction expert based “on altered facts and speculation”).

theoretical model and the facts of the case. In a product liability suit against the maker of a “dock lift” with a handrail, whose vertical path took it by a stationery catwalk with its own handrail, for example, a modern decision excluded testimony that a human hand holding an object two inches in diameter requires more than four inches of clearance, offered in support of plaintiff’s claim that the lift was defective because a “pinch point” between the two handrails was too narrow. This testimony did not fit because plaintiff was not holding anything when the accident occurred.¹⁹ Other times the question of “fit” turns on more subtle differences between models and the facts of the case, and the question is whether the science is close enough to reality to make it useful, as often happens in the area of expert testimony on eyewitness identification.²⁰

Third factor: prejudice, confusion

The third element in *Daubert* is not so much a requirement as a reference to other considerations affecting admissibility: Most importantly, the technicality and complexity of modern science and technological learning bring concerns that such proof may be more confusing, time-consuming, or misleading than it is worth. For such reasons, proof of this sort may be excluded under FRE 403 even if it would otherwise qualify, as *Daubert* makes clear and as the Rules mandate more generally.²¹

Amended Rule 702

The amendment to FRE 702 adopted in 2000 did not “codify” *Daubert*, but was proffered “in response to” *Daubert*, by which the ACN seems to mean that the point was *not* to put the substance of the case into a rule. Instead, the amended language gives direct expression to critical ideas that were almost invisible before, but were part of the mandate that *Daubert* brought forward. Instead of looking only at relevancy, qualifications of the expert, and helpfulness of testimony, *Daubert* said the trial judge is to decide whether the evidence is “reliable” enough to be considered. In performing this function, *Daubert* did *not* want the judge to take either the word of the expert or the representations of the proponent as definitive.

The idea behind the amendment, and this same idea is central to *Daubert*, was to put into words three categories of inquiry by which judges can perform the gatekeeping function. In effect amended FRE 702 states three broad conditions of admissibility by sketching out three broad areas of inquiry. As a result of the amendment, the responsibility of judges in this department is grounded in clear language in the Rule itself. The amendment requires inquiry to determine whether (1) the

19. *Cipollone v. Yale Industrial Products, Inc.*, 202 F.3d 376, 379 (1st Cir. 2000).

20. *United States v. Langan*, 263 F.3d 613, 620-625 (6th Cir. 2001) (excluding testimony on “transference theory” producing memory of previous exposure to innocent person in lineup, which did not “fit” because expert lacked knowledge about eyewitness).

21. *Daubert v. Merrell Dow Pharmaceuticals*, 509 U.S. 579 (1993) (FRE 403 gives courts more authority to control experts than lay witnesses); *Nimely v. City of New York*, 414 F.3d 381, 398 (2d Cir. 2005) (in police shooting suit, error to let forensic pathologist attest truthfulness of police accounts, which was prejudicial, confusing, misleading) (reversing).

testimony is based on “sufficient facts or data,” (2) the testimony is the product of “reliable principles and methods,” and (3) the expert has “reliably applied” those principles and methods to the facts of the case.

Although the amended language does not say it in so many words, it seems that all three of the new conditions are matters for the judge to determine, as the ACN to the amended provision suggests.²² All three affect “admissibility” of evidence, and not merely weight. In effect, they raise “preliminary questions” relating to “the admissibility of evidence” under FRE 104(a).

(1) Sufficient data

The first condition is that there be sufficient facts or data underlying the proffered expert testimony. This standard reflects prior law, at least in the broad sense that courts always had the power to reject expert opinion testimony that lacked a sufficient factual basis. Courts could reject lay testimony that was “speculative,” and could block lay opinions that were unhelpful or did not reflect personal knowledge. The addition of the sufficiency standard in FRE 702 is important in providing express and visible authority to courts to screen out expert testimony that is not adequately supported. This standard underscores the authority of courts to examine expert testimony in the manner contemplated in *Daubert*, and thus adds something important to the Rules.²³

(2) Reliable methods

The second requirement added in the amendment speaks of “reliable principles and methods,” and of course this notion lies at the heart of the *Daubert* standard. This addition to FRE 702 is the one most clearly tied to *Daubert*, and there has never been any doubt that the judge determines these matters, and that they are conditions that must be satisfied if scientific or technical evidence is offered. It is of course this condition that is addressed by the 15 factors listed above, that come from *Daubert*, from *Downing*, and from the ACN to amended FRE 702, which in turn reflects decisions by many courts.²⁴

(3) Reliable application

The question whether the expert has “reliably applied the principles and methods to the facts of the case,” now stated in clause (d) of the amended Rule, was essentially new, although the ACN

22. See ACN (amended FRE 702 affirms “court’s role as gatekeeper,” providing standards to use in assessing “reliability and helpfulness,” and admissibility of expert testimony is governed by FRE 104(a), under which proponent has burden of establishing that “pertinent reliability requirements are met”).

23. *Micro Chemical, Inc. v. Lextron, Inc.*, 317 F.3d 1387, 1392 (Fed. Cir. 2003) (damage expert had sufficient facts or data despite claim that he relied on statements by others and did not independently investigate feedlot industry or review records; need not evaluate correctness of underlying data).

24. *United States v. Mooney*, 315 F.3d 54, 62 (1st Cir. 2002) (*Daubert* does not require proponent to prove opinion is correct, only to show it was reached scientifically and follows reliable methods).

suggests that the requirement was already to be found in the cases.²⁵

Reading clause (d) like the other two clauses, as describing questions that the judge resolves under FRE 104(a) because they affect “admissibility,” the language actually resolves a conflict in the cases. Prior cases held that the question whether a scientist or technician or expert properly applied the principles and methods was a matter that affected weight rather than admissibility. Under this rubric, some decisions held that issues surrounding laboratory protocol in conducting critical forensic tests were for juries to resolve, but others held that they affect admissibility (not just weight).²⁶

The amended language reflects the latter view: Under FRE 702(d), judges are to determine whether the principles and methods were reliably applied. Of course it does not follow that judges cannot admit evidence produced by processes and methods that depart from an ideal or standard protocol, nor that *only judges* can consider this matter. It seems, however, that under FRE 702(d) a judge should resolve the question whether the principles and methods were applied reliably enough to justify relying on the evidence.²⁷ If the judge believes the evidence is reliable and trustworthy (and the other conditions of FRE 702 and *Daubert* are satisfied), she should admit the evidence, but issues relating to application of principles and methods can still be raised at trial itself, and argued and supported or attacked by testimony or other evidence, in the interest of helping the jury weigh the evidence that the trial judge has ruled admissible.

Predictably courts applying amended FRE 702 stress the breadth of judge’s discretion. Still, some reviewing courts have found that the judge erred in applying the new Rule. Occasionally reviewing courts reverse decisions to admit because the requirements of *Daubert* and revised FRE 702 are not satisfied,²⁸ and sometimes decisions to exclude are reversed on appellate findings that the requirements of *Daubert* and revised FRE 702 are satisfied.²⁹

25. See ACN to amended FRE 702 (judge “must scrutinize not only the principles and methods,” but whether principles and methods “have been properly applied to the facts”) linking requirement to *Paoli Railroad* case. See *In re Paoli R.R. Yard PCB Litig.*, 35 F.3d 717, 745 (3d Cir. 1994).

26. Compare *United States v. Shea*, 211 F.3d 658, 668 (1st Cir. 2000) (flaws in application of methodology go to weight, not admissibility) with *People v. Castro*, 144 Misc. 2d 956, 545 N.Y.S.2d 985, 986 (1989) (committing such matters to judge, applying state version of *Frye* standard).

27. *Amorgianos v. National R.R. Passenger Corp.*, 303 F.3d 256, 264 (2d Cir. 2002) (excluding testimony by industrial hygienist who “failed to apply his own method reliably” because he did not take into account volatility, vapor pressure, temperature, humidity, radiant energy). See also Imwinkelried, *The Debate in the DNA Cases Over the Foundation for the Admission of Scientific Evidence: The Importance of Human Error as a Cause of Forensic Misanalysis*, 69 Wash. U. L.Q. 19 (1991) (matters of lab protocol should affect admissibility, not just weight).

28. *Chapman v. Maytag Corp.*, 297 F.3d 682, 686 (7th Cir. 2002) (error to admit testimony by expert holding degree in mechanical engineering suggesting that failure of insulation in pinched wire let current escape from circuit into chassis without tripping circuit breaker; “resistive short” theory was unsupported by any “study or writing,” and witness could not substantiate opinion) (reversing).

29. *Sullivan v. U.S. Department of Navy*, 365 F.3d 827, 833 (9th Cir. 2004) (in malpractice suit arising out of surgery in naval hospital, error to exclude plaintiff’s expert testimony, which reflected generally accepted proposition that duration of surgery bears on likelihood of infection; court abused discretion and “invaded the

***Daubert* applies across the board**

As noted above, on the day *Daubert* was decided there were already questions as to its breadth, as Chief Justice Rehnquist commented in his dissent. *Daubert* itself involved evidence that clearly everyone would classify as “scientific” (reanalysis of epidemiological studies). The decision in *Daubert* is tied to the word “scientific” in FRE 702, and the opinion rests on this basic interpretive move. No doubt engineering and medicine and psychology, for example, rest on science at least in part, and perhaps they should be classified science, but they might also be termed “technical” knowledge, which term also appears in FRE 702. The other term in the Rule (“specialized knowledge”) seems better than “science” as a description of expertise in such fields as economics, real estate appraisal, and operations of drug traffickers. Adding to the problem of interpreting the case, the criteria spelled out in *Daubert* seem at home with “hard” science, and less congenial to other areas of technical expertise.

***Kumho Tire* case**

The Court addressed this problem in *Kumho Tire* in 1999. The case involved expert testimony that a tire on a minivan failed because it was defective, and the expert announced criteria that he used to decide whether the failure resulted from a defect in design or manufacture, or from improper maintenance. The court excluded this testimony, but the Eleventh Circuit thought *Daubert* did not apply, and reversed. The Supreme Court agreed with the trial judge, and held that *Daubert* applies to all expert testimony, across the board.³⁰ *Kumho Tire* presented the Court with stark choices, each having its own strengths and drawbacks: One possibility was to limit *Daubert* to a subclass of expert testimony that is “scientific,” which would fit the factors that *Daubert* set forth to guide courts in appraising the reliability or validity of testimony, but would also bring the problem of drawing a line between scientific expertise and other kinds, and might require other standards for other branches of expertise. Another possibility was to loosen *Daubert* so it could be applied to evidence as disparate as epidemiology and accounting, at the risk of making the standard vague or general, detracting from any sense of rigor.

Kumho Tire took the second course. To bring home the breadth of *Daubert*, *Kumho Tire* cited the example of a “perfume tester” in making the point that “experience-based” expertise must be examined for reliability. The court commented that a person who can “distinguish among 140 odors at a sniff” may be required at least to show that his preparation is “of a kind that others in the field would recognize as acceptable.” After *Kumho Tire*, clearly trial judges have “gatekeeping” responsibilities whenever expert testimony is offered.³¹ It is worth noting that a

province of the expert” in requiring underlying texts to state “precise type of harm” that testimony would explain) (reversing, remanding, and directing that different judge preside).

30. *Kumho Tire Co. v. Carmichael*, 526 U.S. 137, 142, 152 (1999) (twice making point that judges have discretion in both choosing among and applying *Daubert* factors).

31. *United States v. Lopez-Lopez*, 282 F.3d 1, 13-14 (1st Cir. 2002) (applying *Daubert* in admitting testimony by Customs Agent about operations of international drug traffickers), *cert. denied*, 536 U.S. 949; *United States v. Langan*, 263 F.3d 613, 620-625 (6th Cir. 2001) (*Daubert* applies to expert testimony on accuracy of eyewitness

number of states, including some that have adopted the *Daubert* standard, have not followed the lead of *Kumho Tire*, instead imposing the reliability standard only on “scientific” evidence (sometimes only to “novel” science), and not to experiential expertise.³²

In *Kumho Tire*, the Court addressed the problem of applying this same standard broadly to experiential expertise by stressing the “flexibility” of the standard and the “discretion” of trial judge. The opinion in *Daubert* had not spoken of discretion, but the *Joiner* decision in 1997 had mentioned discretion in applying *Daubert* not less than 19 times, the Court having been pushed in that direction because *Joiner* involved a review of a peculiar ruling by the Eleventh Circuit that judges were to be reviewed in a more rigorous way if they *excluded* expert testimony under *Daubert*. In effect, the Court in *Joiner* adopted a discretionary rule as a way of rejecting the notion that *Daubert* should be understood as strongly favoring admissibility of expert testimony.³³ *Kumho Tire* used the same term later in the same year at least seven times. The Court wrote in *Kumho Tire* that the *Daubert* factors “do not all necessarily apply” in every case (even if the expertise involves “science” as such), and that *Daubert* is above all a “flexible” standard. Hence a court applying *Daubert* has “broad latitude” not only in deciding whether proffered evidence is reliable, but also in deciding “how to determine reliability.”³⁴

Writing in 1994 prior to the decision in *Kumho Tire*, the Sixth Circuit cited a good example illustrating the difference between scientific and experience-based expertise in the *Berry* case:

[I]f one wanted to explain to a jury how a bumblebee is able to fly, an aeronautical engineer might be a helpful witness. Since flight principles have some universality, the expert could apply general principles to the case of the bumblebee. Conceivably, even if he had never seen a bumblebee, he still would be qualified to testify, as long as he was familiar with its component parts.

On the other hand, if one wanted to prove that bumblebees always take off into the wind, a beekeeper with no scientific training at all would be an acceptable expert witness if a proper foundation were laid for his conclusions. The foundation would not relate to his formal training, but to his firsthand observations. In other words, the beekeeper does not know any more about flight principles than the jurors, but he has seen a lot more bumblebees than they

identification).

32. *State v. White*, 642 S.E.2d 607 (S.C. 2007) (dog handler’s evidence based on experience need not satisfy *Daubert* standard because it is not scientific knowledge); *Marron v. Stromstad*, 123 P.3d 992, 1006 (Alaska 2005) (expert testimony based on “specialized knowledge,” experience and intuition, “is not empirically verifiable or objectively testable,” and *Daubert* “is useless as a criterion” here) (drawing on work of Professor Stephen Saltzburg).

33. *General Electric Co. v. Joiner*, 522 U.S. 136 (1997) (rejecting view that decisions excluding expert testimony are reviewed by a more stringent standard than decisions admitting; in both situations, abuse-of-discretion standard applies).

34. *Kumho Tire Co. v. Carmichael*, 526 U.S. 137, 142, 152 (1999) (saying twice that judges have discretion in both choosing among and in applying *Daubert* factors).

have.³⁵

A later opinion in Illinois suggested that the hypothetical beekeeper mentioned in *Berry* could testify on the basis of years of experience “that bees always take off into the wind” and that if particular bees “take off heading due west,” then one can be sure that “the wind is blowing from the west,” and the beekeeper may give those opinions because they rest on “generalized knowledge of bees” coupled with “firsthand observations,” and they help explain his “deductive process” in reaching his conclusions.³⁶

Under *Kumho Tire*, a witness who comes to court to give experience-based expert testimony or specialized knowledge must be able to say more than that his opinion rests on his particular experiences in some line of endeavor.³⁷ He must provide information about the nature of that experience and show how he brought it to bear on the matter at hand. The expert must describe some method of analysis that explains the conclusion he proposes to present, providing some comparable data that can act as a basis for reaching that conclusion.³⁸ While *Kumho Tire* said courts have discretion *both* in selecting criteria by which to judge the reliability of proffered expertise *and* in deciding whether the criteria are satisfied, *Kumho Tire* clearly did *not* mean that courts can ignore or decide against applying whatever criteria might shed light on reliability. *Kumho Tire* does not mean that courts should give such testimony a free pass. In the words of the 2000 ACN, a witness testifying on the basis of experience “must explain how that experience leads to the conclusion” and “why that experience is a sufficient basis” and “how that experience is reliably applied” to the facts of the case.³⁹

On the other hand, *Kumho Tire* did not disapprove experience-based expertise. Witness qualifying as experts on the basis of experience or specialized knowledge need not support their opinions with data that achieves mathematical precision derived from controlled studies, nor with reference to studies or theories developed by others and recognized widely within some recognized field. As the ACN to the amended Rule points out, the amendment does *not* mean that “experience

35. *Berry v. City of Detroit*, 25 F.3d 1342, 1349-1350 (6th Cir. 1994).

36. *Harris v. Cropmate Co.*, 706 N.E.2d 55, 60 (Ill. App. 1999). *But see* *Donaldson v. Central Ill. Public Service Co.*, 767 N.E.2d 314 (Ill. 2002) (disapproving *Harris* as imposing the wrong standard).

37. *Mack Trucks, Inc. v. Tamez*, 206 S.W.2d 572, 580 (Tex. 2006) (excluding testimony by expert in ignition-caused fuel fires because he “did no more than set out ‘factors’ and ‘facts’ which were consistent with his opinion,” then suggested that fire began with diesel fuel from tractor; reliability inquiry does not ask whether conclusion is correct, but whether method is reliable); *Hoy v. DRM, Inc.*, 114 P.3d 1268 (Wyo. 2005) (excluding testimony by experts who could not “rule out other causes” for leach field failure, apart from acts by defendant contractor; they “never explained exactly how their experience and knowledge or the texts supported their opinions”).

38. *United States v. Jones*, 107 F.3d 1147, 1160 (6th Cir. 1997) (admitting expert testimony on handwriting; witness “outlined the procedure that he uses” in comparing questioned signature with known one, “then focused on enlargements” and described “in some detail” how he reached his conclusions, so his testimony “enabled the jury to observe firsthand the parts of the various signatures on which he focused”).

39. *See* ACN to FRE 702.

alone—or experience in conjunction with other knowledge, skill, training or education—may not provide a sufficient basis” for expert testimony, and of course the text of amended FRE 702 *continues* to say expert testimony may rest on experience.

Often issues relating to the admissibility of scientific or technical evidence are complicated. Their resolution may require briefs, affidavits, even live testimony or deposition transcripts. Neither *Daubert* nor *Kumho Tire* mandates any particular form of hearing, nor do they address the question whether the jury should or must be excused when a hearing is held.

Procedure: Pretrial rulings

Pretty clearly these matters should be taken up in a separate hearing, and such hearings should be conducted before trial.⁴⁰ Here the court takes testimony and other evidence needed to decide whether the proffered expertise is valid and reliable, considering such things as error rates, acceptance in the relevant community, existence of standards and peer reviewed literature, how closely the testimony fits the case, and whether theory and methods were properly applied.⁴¹

The burden of satisfying *Daubert* and FRE 702 rests on the proponent, just as it is generally true that the proponent of evidence must show that it is relevant and admissible under whatever Rules of Evidence apply.⁴² It follows that ordinarily the proponent of expert testimony should make the pretrial motion, but no rule actually requires a motion. The matter can be brought to the fore by a motion in limine to exclude evidence that the opponent anticipates, which is in effect an advance objection, or by a motion in limine to admit the evidence, which is simply an advance proffer.⁴³

40. *Daubert v. Merrell Dow Pharmaceuticals, Inc.*, 509 U.S. 579 (1993) (court “must determine at the outset” whether science is valid); *Clemons v. State*, 896 A.2d 1059, 1063 n.6 (Md. 2006) (preferable to rule on admissibility prior to trial; issues are usually “collateral”); *In re Air Crash at Little Rock, Arkansas*, 291 F.3d 503, 514 (8th Cir. 2002) (*Daubert* issues should be “raised prior to trial” and hearing should not be conducted during morning recess in middle of trial; on remand, *Daubert* hearing should be conducted before trial); *Alfred v. Caterpillar, Inc.*, 262 F.3d 1083, 1086 (10th Cir. 2001) (*Daubert* issues should not be deferred to late stage where there has been no motion or concurrent objection; counsel should not sandbag opposing party; *Daubert* contemplates gatekeeping function, not “gotcha” function); *Jahn v. Equine Services, PSC*, 233 F.3d 382, 393 (6th Cir. 2000) (error to exclude plaintiff’s experts in summary judgment motion without hearing, on record that was “insufficient,” for *Daubert* requires record that is “complete enough” to assess reliability).

41. *United States v. Yousef*, 327 F.3d 56, 148 (2d Cir. 2003) (require defense to produce expert for *Daubert* hearing, on pain of excluding testimony if he was not produced); *In re Paoli R.R. Yard PCB Litig.*, 35 F.3d 717, 738 (3d Cir. 1994) (can authorize opponent to conduct discovery of experts who are to testify in hearing; each side to depose other side’s experts to critique methodologies); *DeLuca by DeLuca v. Merrell Dow Pharmaceuticals, Inc.*, 911 F.2d 941, 954 (3d Cir. 1990) (to extent that mode of analysis deviates from well-established methods, court must “conduct a hearing and analysis”).

42. *Zenith Electronics Corp. v. WH-TV Broadcasting Corp.*, 395 F.3d 416, 419 (7th Cir. 2005) (proponent bears burden of production in showing that *Daubert* standard is satisfied), *cert. denied*, 545 U.S. 1140; *United States v. Hicks*, 389 F.3d 514, 525 (5th Cir. 2004) (proponent has burden of showing that expert testimony is reliable under *Daubert*), *cert. denied*, 546 U.S. 1089.

43. *Hose v. Chicago Northwestern Transp. Co.*, 70 F.3d 968, 972 (8th Cir. 1995) (challenges to scientific validity

Sometimes the matter is not raised by preliminary motion, but arises at trial. The issues are likely to be technical, and often any hearing is lengthy and the substance of the testimony is likely to be beyond the understanding of jurors and of little human interest to a lay audience. Hence it is wiser to excuse the jury. The only clear consideration that cuts in favor of letting the jury observe and listen is that factors affecting admissibility may also affect weight, and letting the jury hear foundation testimony may provide a head start. This consideration does not seem reason enough, however, to subject jurors to these hearings. Their presence is likely to encourage posturing by the witnesses and by the lawyers, and may become problematic because the Rules do not apply to admissibility hearings, and at least some of what is offered in this setting should not be heard by the jury. There is also some risk that allowing a jury to hear the preliminary skirmishes over the validity of the science will lead trial courts to abandon their gatekeeping responsibilities and simply to pass along to the jury the issues presented, which plainly is the wrong approach under *Daubert* and FRE 702 as amended.⁴⁴

Often there is no way to avoid a hearing if the issue is joined, whether by pretrial motion to admit that is met by objection, or by pretrial motion to exclude that is met by a proffer, or in some other way.⁴⁵ It may be possible to save time if it turns out that there is some point that is decisive, in which case it is not necessary to range over the whole subject, and the court can decide whether testimony is reliable without considering other factors.⁴⁶ In this setting as in others, detailed findings can help explain and make transparent whatever decision on admitting or excluding is ultimately reached, facilitating later review by showing how the judge approached the problem and what factors were behind the decision. Reviewing courts almost never require detailed findings in evidentiary rulings, however, and satisfy themselves on the basis of general indications that trial judge did or did not consider the appropriate criteria. Modern authority includes an important opinion by the late Judge Becker, long a leader in this area, that rejects any requirement that the judge make detailed findings.⁴⁷

should be addressed prior to trial) (faulting defendant for failing to make pretrial motion to exclude medical testimony based on PET scan and polysomnogram).

44. *But see* United States v. Mendoza-Paz, 286 F.3d 1104, 1113 (9th Cir. 2002) (rejecting claim that judge should have held *Daubert* hearing outside jury's presence) (expert testimony on value of drugs).

45. United States v. Velarde, 214 F.3d 1204 (10th Cir. 2000) (court did not determine whether *Daubert* was satisfied with expert testimony that victim suffered abuse; court assumed proffered testimony was so "ordinary" that reliability determination was unnecessary, but gave no indication why, or why methods could be taken for granted; reliability determination must be "apparent from the record" and court abused discretion in failing to make it; also error in not holding reliability hearing for testimony by second expert that victim's behavior was consistent with abuse; defense asked for hearings) (reversing).

46. United States v. Cruz, 127 F.3d 791, 800-801 (9th Cir. 1997) (need not require testimony on all *Daubert* factors; these were not intended as definitive checklist but as guide), *cert. denied*, 522 U.S. 1097.

47. United States v. Mitchell, 365 F.3d 215, 233 (3d Cir. 2004) (judge ruled from bench and "elected not to make findings of fact or conclusions of law," but absence of findings does not require plenary review; rulings are reviewed for abuse of discretion), *cert. denied*, 543 U.S. 974.

Often, and indeed perhaps more often than not, it is not necessary to hold a *Daubert* hearing. The pivotal issue presented by proffered expert testimony may already have been resolved in cases that are definitive on the point, or factual issues may have been resolved in other cases in a manner that invites judicial notice. Thus, for example, lie detector evidence is still almost always excluded from trials, and courts generally know (and many cases hold) that such proof does not satisfy either the *Daubert* or the earlier *Frye* standard, and courts may exclude such proof without inquiring anew each time into issues of validity or reliability. This particular shortcut to decision can be explained in terms of *stare decisis* or authoritative precedent, or sometimes in terms of judicial notice (a kind of judicial notice that is not regulated by FRE 201 because it does not involve “adjudicative” facts). In these ways, other cases may provide adequate ground either to resolve issues under *Daubert* and FRE 702 in favor of admissibility,⁴⁸ or to resolve them against admitting the proof.⁴⁹

Procedure: Scope of review

Sometimes other alternatives to a full-fledged hearing are available. The points necessary to decide the issues can sometimes be developed adequately in briefs, or by arguments of counsel, sometimes augmented by affidavits, so that a more elaborate hearing inviting testimony and other proof becomes unnecessary, and courts can rule in more summary fashion on the basis of such material.⁵⁰ Sometimes issues of validity or reliability are sufficiently familiar, and the foundational inquiries are simple enough, that a court can avoid a pretrial hearing, as is often true when the validity question turns mostly on the experience of the witness and his degree of familiarity with the relevant facts.⁵¹ Sometimes appropriate findings rest almost entirely on the fact that the

48. *United States v. Crisp*, 324 F.3d 261, 268 (4th Cir. 2003) (“need not expend scarce judicial resources re-examining” familiar expertise; if theory or technique is firmly established as scientific law, “it need not be examined at all” and may be judicially noticed); *United States v. Jokobetz*, 955 F.2d 786, 793-794 (2d Cir. 1992) (may take judicial notice of general acceptability of theory and technique), *cert. denied*, 506 U.S. 834; *Johnson v. Commonwealth*, 12 S.W.3d 258, 261 (Ky. 1999) (courts admit or exclude much evidence without “reinventing the wheel” by requiring “full demonstrations” of validity of methods or techniques that have been scrutinized before; such inquiry not required for comparisons of microscopic samples of human hair) (quoting authors of this Treatise); *State v. O’Key*, 321 Or. 285, 899 P.2d 663, 673 n.8 (1995) (sometimes validity may be determined by judicial notice) (citing authors of this Treatise).

49. *United States v. Prince-Oyibo*, 320 F.3d 494, 498 (4th Cir. 2003) (retaining *per se* rule against lie detector evidence).

50. *Miller v. Baker Implement Co.*, 439 F.3d 407, 412 (8th Cir. 2006) (excluding plaintiff’s experts without hearing; plaintiff had enough chance to present arguments during motion); *United States v. Alatorre*, 222 F.3d 1098, 1100 (9th Cir. 2000) (nowhere do *Daubert* or *Kumho Tire* address form or nature of inquiry; hearing outside presence of jury not required; on voir dire, defense could explore qualifications and basis for testimony).

51. *United States v. Robertson*, 387 F.3d 702, 704 n.2 (8th Cir. 2004) (admitting testimony on modus operandi of drug dealers; *Daubert* hearing is not always required before qualifying expert); *United States v. Nichols*, 169 F.3d 1255, 1263 (10th Cir. 1999) (declining to hold *Daubert* hearing on testimony by bomb expert; evidence involved no

proffered evidence has achieved a level of general acceptance that alone suffices to establish reliability,⁵² or even unreliability.⁵³ Sometimes *Daubert* issues can be resolved by consulting journals or treatises, and the experience of regulatory agencies is a pertinent factor to count in appraising official studies, and may suffice as a basis to conclude that the underlying science is valid.⁵⁴

The latitude and discretion accorded to trial judges in applying *Daubert* indicate that the “abuse-of-discretion” standard applies in appellate review of rulings admitting or excluding expert testimony. In its 1997 decision in *Joiner*, the Court affirmed that decisions applying *Daubert* are reviewed under this standard, rejecting an argument that a ruling excluding scientific evidence should satisfy a more stringent standard.⁵⁵ It is hard to imagine any debate on this point when it comes to the requirement of “fit” and risks under Rule 403.

Impact of *Daubert*

It is far less clear, however, that such deference is appropriate for more “substantive” *Daubert* factors relating to validity and reliability, particularly when they obviously transcend considerations peculiar to the case at hand. To be sure, the generality of the *Daubert* factors, and the “flexibility” that trial judges enjoy in selecting and applying them, favor a lenient standard of review. Still, *Daubert* issues lend themselves well to appellate briefing, particularly when reinforced by affidavits or testimony from hearings at the trial level, and appellate courts can reach judgments on issues of reliability that are as good as or better than the ones trial judges can make. Where the issues apply across a wide range of cases, uniformity becomes a higher value, and often credibility issues recede in importance.⁵⁶ A casual look at the thousands of appellate opinions raising *Daubert* issues conveys the message that trial judges need help. Questions relating to the validity or reliability of such things as laboratory and statistical methods for gathering and

new theory or novel testing methodologies), *cert. denied*, 528 U.S. 934.

52. *Daubert v. Merrell Dow Pharmaceuticals*, 509 U.S. 579 (1993) (widespread acceptance can be “important factor”).

53. *United States v. Downing*, 753 F.2d 1224, 1237-1242 (3d Cir. 1985) (acceptance “may well be decisive, or nearly so,” and known technique that attracts “minimal support” is likely to be unreliable).

54. *Ellis v. International Playtex, Inc.*, 745 F.2d 292, 303-304 (4th Cir. 1984) (government studies are “presumed to reflect methodologies accepted by the scientific community”).

55. *General Elec. Co. v. Joiner*, 520 U.S. 114 (1997) (abuse-of-discretion standard applies to review of rulings applying the *Daubert* standard).

56. See Mueller, *Daubert Asks the Right Questions: Now Appellate Courts Should Help Find the Right Answers*, 33 *Seton Hall L. Rev.* 987 (2003) (developing arguments sketched above); Faigman, *Appellate Review of Scientific Evidence Under Daubert and Joiner*, 48 *Hastings L.J.* 969, 977 (1997) (advocating “hard look” or *de novo* standard for scientific issues).

analyzing DNA evidence are more like questions of law than questions of fact. For all these reasons, appellate courts do not always apply a lenient standard on review, nor should they. While many state decisions endorse an abuse-of-discretion standard, a significant minority apply a *de novo* standard to many issues of reliability under *Daubert* or its state equivalent.⁵⁷

Few cases are as influential as *Daubert*. Its impact is roughly indicated by the fact that it was cited in more than three thousand five hundred appellate opinions across the country in the first fifteen years. *Daubert* represented a new departure for federal law, and it applies in federal courts throughout the land. Although not binding in state systems, the opinion has proved influential there as well. A search of reported opinions reveals that 27 states have adopted the *Daubert* standard or take very similar approaches, and that 22 states decline to follow *Daubert* (most following their own versions of the *Frye* standard).⁵⁸ Even among the states declining to follow *Daubert*, however, some opinions indicate that the *Daubert* reliability factors count in deciding whether to admit or exclude scientific evidence.

It is hard to say whether *Daubert* tightened or loosened the standard for scientific evidence, but we believe on balance that *Daubert* tightened the standard. *Daubert* came amidst increasing concern over “junk science,” and on remand the lower court again excluded the evidence (on a slightly different ground). Also the *Daubert* criteria are more elaborate and specific than the single factor emphasized in *Frye*, inviting closer scrutiny.⁵⁹

57. *Jennings v. Baxter Healthcare Corp.*, 14 P.3d 596 (Or. 2000) (decision on scientific validity is reviewed as for “errors of law”); *Goeb v. Tharaldson*, 615 N.W.2d 800, 814-815 (Minn. 2000) (whether proffered expertise satisfies general acceptance standard “is a question of law that we review *de novo*,” but questions of “foundational reliability” are reviewed for abuse of discretion); *Kuhn v. Sandos Pharmaceuticals Corp.*, 14 P.3d 1170, 1179 (Kan. 2000) (adopting *de novo* standard for review of proof of medical causation); *Haddad v. State*, 690 So. 2d 753, 578 (Fla. 1997) (review of *Frye* issues is *de novo*); *Taylor v. State*, 889 P.2d 319, 331 (Okla. 1995) (decision to admit novel scientific evidence should be subject to “an independent, thorough review”); *State v. Harvey*, 699 A.2d 596, 619 (N.J. 1995) (question whether scientific community generally accepts method or test “can transcend a particular dispute,” and to extent *Frye* focuses on issues other than credibility or qualifications, “deference to the trial court is less appropriate”); *State v. Tankersley*, 956 P.2d 486, 464 (Ariz. 1994) (*Frye* issues are subject to *de novo* review); *Schultz v. State*, 664 A.2d 60, 64 (Md. App. 1994) (question of reliability “does not vary according to the circumstances of each case,” so it is inappropriate to review for abuse of discretion); *State v. Cauthron*, 846 P.2d 502, 505 (Wash. 1993) (court reviews *de novo* a decision to admit or exclude novel scientific evidence); *United States v. Porter*, 618 A.3d 629, 634 (D.C. Ct. App. 1992) (questions of general acceptance of new scientific techniques invite court “to establish the law of the jurisdiction for future cases,” so court would “engage in a broad review”).

58. Decisions in 27 states adopt *Daubert* or cite it while taking a similar approach: Alabama, Alaska, Arkansas, Colorado, Connecticut, Delaware, Hawaii, Kentucky, Louisiana, Massachusetts, Michigan (statute covering suits for injury or death), Montana, Nebraska, New Hampshire, New Jersey, New Mexico, North Carolina, Ohio, Oklahoma, Oregon, Rhode Island, South Dakota, Tennessee, Texas, Vermont, West Virginia, and Wyoming. Decisions in 22 other states refrain from following *Daubert*. Among these, most follow something close to *Frye*, but some have abandoned *Frye* and still decline to follow *Daubert*: Arizona, California, Florida, Georgia, Idaho, Illinois, Indiana, Iowa, Kansas, Maryland, Maine, Minnesota, Missouri, Mississippi, Nevada, New York, North Dakota, Pennsylvania, South Carolina, Utah, Washington, and Wisconsin. One state (Virginia) has not decided the issue.

59. See Hanson, Fewer post-*Daubert* federal judges allow experts to testify without limitation in civil trials, study

finds, 87 A.B.A. J. 28 (2001). *See generally* Huber, Junk Science in the Courtroom, 26 Val. U. L. Rev. 723 (1992); Huber, Galileo's Revenge: Junk Science in the Courtroom (1991). *And see* Daubert v. Merrell Dow Pharmaceuticals, 43 F.3d 1311, 1318-1319 (9th Cir. 1994) (on remand, again excluding the evidence), *cert. denied*, 516 U.S. 869. *See also* Ambrosini v. Labarraque, 966 F.2d 1464, 1467-1470 (D.C. Cir. 1992); Richardson v. Richardson-Merrell, Inc., 857 F.2d 823 (D.C. Cir. 1988), *cert. denied*, 493 U.S. 882 (both indicating skeptical attitude and advocating close scrutiny).