Scientific and Other Expert Testimony: Understand It; Keep It Out; Get It In[†]

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I. Introduction

Junk Science in the courtroom shall be no more. Thus said the United States Supreme Court in *Daubert v. Merrell Dow Pharmaceuticals Inc*.[1] This rule applies, whether the testimony under consideration is "pure science," or whether it constitutes more general expert testimony in such specialties as engineering, mechanics, economics and the like.[2] However, what makes technical or other expert evidence admissible — or not admissible at all – is still a "Never-Never Land" for many attorneys as well as many judges.

When faced with an offer of expert testimony under Federal Rule of Evidence (FRE) 702, the trial judge must make a preliminary assessment of whether the reasoning or methodology is "scientifically valid" *and* "properly can be applied to the facts at issue,"[3] within the dictates of FRE 104(a). As all litigants know by now, the trial judge first should make a determination whether the proposed testimony is relevant to the facts at issue in the case. If the testimony which is being offered does not satisfy the relevancy requirements, it matters not how scientifically accurate the proposed testimony might be. This is Supreme Court "Holy Writ," but it also is pretty basic common sense. Assuming that the court already has determined that the proposed testimony is relevant, the overarching question for the trial judge in a federal court, or any other tribunal that follows the Federal Rules of Evidence, is whether the testimony to be offered is "reliable."

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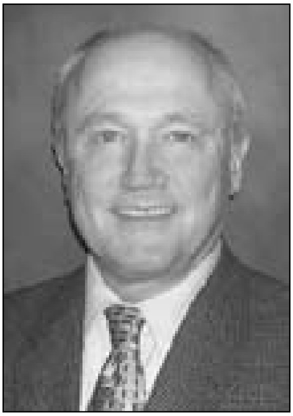
† Submitted by the author on behalf of the FDCC Products Liability Section.

1 509 U.S. 579 (1993).

2 Kumho Tire Co. v. Carmichael, 526 U.S. 137 (1999).

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



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For the last decade the Supreme Court has mandated that the methodology employed by the expert must conform sufficiently to what has been called the "Scientific Method."[4] In doing so, the court must look to a number of factors that include, without limitation:

- whether the reasoning or methodology underlying the testimony has been tested;
- whether the reasoning or methodology has been subjected to peer review and publication;
- the potential rate of error of the reasoning or the methodology offered by the expert; and
- whether the reasoning or the methodology has been generally accepted or rejected in a relevant scientific discipline.

[4] It is important to note that the "Scientific Method" does not apply only to scientific or engineering matters. Rather, it applies to any method of analysis requiring the formation of an opinion or hypothesis, and then validating that opinion.

The last entry on this list sounds suspiciously like the so-called *Frye* rule.[5] Historically, in jurisdictions such as Illinois where *Frye* is strictly followed, it is only necessary that the expert make the statement or offer evidence that the methodology employed is accepted in his or her discipline. This self-serving statement, by itself, would be sufficient to allow the jury to hear the evidence in most cases. However, under either the *Frye* rule or the *Daubert* rule, whether the "generally accepted" principle can and should be subject to rigorous examination to test the basis for what the expert states is generally acceptable. A fifty-state survey of the "Standards for the Admissibility of Scientific Expert Testimony" is included as Appendix 1 of this article.

Even in a state court that does not follow *Daubert*, a *Daubert*-type cross-examination following a motion in limine or before the jury will reap substantial benefit. However, before discussing viable types of arguments, it would be helpful to understand how trial judges actually view their responsibilities under the *Daubert*/*Kumho* rule.

II.
HOW JUDGES USE THE DAUBERT CRITERIA

In 2001, nearly four hundred state court judges participated in a national survey about expert evidence in the post-*Daubert* world.[6] Interestingly, thirty-two percent of the judges believed that the intent of *Daubert* was to raise the threshold of admissibility for scientific evidence; twenty-three percent believed that the intent was to lower the threshold for admissibility; and thirty-six percent believed that the Supreme Court intended neither to lower nor raise the threshold for admissibility.[7] These latter judges in particular felt that the "intent was to articulate a framework for admissibility and to give Judges the discretion to apply the guidelines as appropriate."[8] Finally, eleven percent of the judges were uncertain as to what the Supreme Court intended in the *Daubert* ruling. Most of the judges (about seventy-five percent), however, believed that *Daubert* generally intended to guard against "junk science" in the courtroom.[9] When the judges discussed the value of *Daubert* in terms of establishing parameters for judicial decision-making regarding the admissibility of scientific evidence, fifty-five percent reported that *Daubert* had a "great deal" of value because it provided a decision-making construct and recited considerations that framed admissibility[10] – very good news, indeed!

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5 Frye v. United States, 293 F. 1013 (D.C. Cir. 1923).

6 Sophia I. Gatowski et al., *Asking the Gatekeepers: A National Survey of Judges on Judging Expert Evidence in a Post-Daubert World*, 25 LAW & HUMAN BEHAVIOR 433-458 (2001).

7 *Id*. at 443.

8 *Id*.

9 *Id*.

10 *Id*.

Most of the judges (over ninety percent) likewise believed that the "gate keeper" role was appropriate for a judge, irrespective of the admissibility rule followed in the particular state, and two-thirds thought that they took an "active role" in the admissibility process.[11] Such data is significant in guiding trial strategy because it confirms that the first line of attack in arguing admissibility should be directed at the trial judge.

Though a majority of the judges, whether following *Daubert* or *Frye*, weighed testing of the proposed scientific or technical theory very heavily, the study concluded that most of the judges did not really understand the concept of testing.[12] Therefore, any *Daubert/Frye* motion should commence with an explanation of the testing concept. Only a few of the judges surveyed were able to verbalize the testing concept or its purpose, i.e., knowing to what extent a theory had been properly and sufficiently tested and whether or not research had attempted to prove the theory right or wrong.[13] These judges felt that if it were not possible to test the evidence, that inability would weigh heavily in their decision on admissibility. Other judges simply noted that they would want to know whether the theory was tested, with no further delineation of the term, and about a third of the judges did not even understand the meaning of "testing" (scientifically termed "falsifiability").[14] This last cohort essentially thought that they should simply assess whether they believed the test results were false.[15]

Over ninety percent of the judges said that error rate was useful when determining whether to admit scientific evidence.[16] Again, however, only a small percentage of the judges understood error rate to be the equivalent of the *probability* of making a mistake.[17] Many felt that the error rate referred to in *Daubert* simply counted the number of mistakes made in the testing or analysis.[18]

Under any standard, the great majority of judges felt that peer review was useful for determining the admissibility of expert testimony; many noted that they would be highly likely to reject anything not subjected to the analysis of rigorous peer review.[19] This factor, however, is the least likely of the *Daubert* criteria to be available for any methodology except, perhaps, epidemiological testimony. And understandably, the greatest majority of judges also indicated that general acceptance was still a useful criterion for determining whether to admit scientific evidence.[20] Apparently, the "old school" still thrives.

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[11] *Id*.

[12] *Id*. at 444.

[13] The study found that only four percent of the survey participants truly understood the concept of scientific testing. *Id*.

[14] *Id*. at 445.

[15] *Id*.

[16] *Id*.

[17] *Id*. at 447.

[18] *Id*.

[19] *Id*.

[20] *Id*.

With respect to the importance (weight or prioritization) accorded each of the *Daubert* criteria, there was very little consensus about how to best combine the *Daubert* factors.[21] Almost half of the judges identified one or another of the criteria as that to which they would accord the greatest weight. Again, not surprisingly, most prevalent in that group was the general acceptance test.[22]

Considering the "scientific evidence" of *Daubert* versus the "technical or otherwise specialized knowledge" in *Kumho*, a majority of the judges stated that the distinction between "science" and some other form of knowledge should be made on a case-by-case basis.[23] Most of these judges equated scientific knowledge with the "generation of new knowledge," while technical knowledge was considered to be the "application of known facts."[24] About a third of the judges thought that science was objective and less open to interpretation than other forms of knowledge.[25]

III.
Using Daubert/Kumho to Advantage

A. *In the Courtroom*

Given the foregoing survey, it seems apparent that most judges need not know how to formulate a scientific study. That being said, however, they still must know how to evaluate (and reject) improper studies. To that end, judges – and juries – must be trained by attorneys and experts to be critical of the science, engineering, or other expert testimony that comes before them. They must be taught the questions to ask and the issues of methodology and statistics that scientists and other experts should address when presenting information and opinions for admission into evidence.

In any given litigation, it probably will not be possible to apply all of the *Daubert* avenues of inquiry. However, in any factual situation, it is always possible to question the methodology and analysis employed by the expert when arriving at the opinion under discussion by questioning whether the expert really adhered to *Daubert*'s "Scientific Method" in forming his or her opinion.

The concept of the "Scientific Method" is as simple as it is elegant. It has been defined as: "The principles and procedures for the systematic pursuit of knowledge involving the recognition and formulation of a problem, the collection of data through observation and experiment, and the formulation and testing of hypotheses."[26] This concept of "Scientific

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[21] *Id*. at 448.

[22] *Id*.

[23] *Id*. at 448-49.

[24] *Id*.

[25] *Id*.

[26] Merriam-Webster Dictionary (1999).

Method" is that usually learned and applied in high school or university natural science classes. It may not have been termed the "Scientific Method," but it is the method of analysis that has been used throughout history to proceed verily from a preliminary hypothesis to a conclusion.

Consider the situation usually encountered with one's own physician. If a patient presents before the physician with a persistent cough, the physician immediately will make a number of preliminary possible diagnoses. It could be flu, pneumonia, emphysema, or some more serious problem in the patient's chest and lungs. In order to determine the actual cause of the patient's cough, the physician will perform a number of observations, examinations, or tests to rule out as many causes as possible in order to pinpoint the exact cause. This exemplifies the Scientific Method, and it should be used as an analogy before the judge or jury to put them in the proper frame of mind to understand the cross-examination of an adversary's expert.

As noted, most trial judges in the earlier survey considered that the meaning and application of the *Daubert* factor labeled "Testing" are ambiguous. In his opinion, concurring in part and dissenting in part, even Chief Justice William Rehnquist stated, "I am at a loss to know what is meant when it is said that the scientific status of a theory depends upon its 'falsifiability . . . .' "[27] It remains to determine whether the reservations of the late Chief Justice can be addressed.

From the time of Sir Francis Bacon (1561-1626) and before, the Scientific Method essentially has acknowledged that science is a process — a way of examining the natural world and discovering important truths about that world. In the last part of the twentieth century, the Austrian philosopher, Sir Karl Popper (1902-1994), argued that once a theory is present it is the duty of the scientist to extract from the theory all of the logical but unexpected predictions which, if they are shown by experiment not to be correct, will serve to render the theory invalid.[28] In other words, once an expert arrives at a hypothesis that fits all or most of the known facts, the expert should proceed to attack the hypothesis at its weakest point to determine whether predictions which logically follow from that point can be shown to be false. This is the falsification or falsifiability referred to by Chief Justice Rehnquist. And this is what greater than ninety percent of the experts fail to do.

At this point, it might be best to turn to the source of the *Daubert* court's reasoning and study Popper's writings first hand.[29] These publications framed the core of the Supreme Court's reasoning in *Daubert*. Furthermore, quotes from these same sources should be

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[27] *Daubert*, 509 U.S. at 600.

[28] KARL R. POPPER, THE LOGIC OF SCIENTIFIC DISCOVERY (1959).

[29] Try reading POPPER, *supra*, as well as his CONJECTURES AND REFUTATIONS: THE GROWTH OF SCIENTIFIC KNOWLEDGE (5th ed. 1989).

used to flesh out specific arguments in any given case. After all, what court can ignore the argument that it should base its decision on the same logic and the same philosophy that the Supreme Court used to decide *Daubert*?[30]

Placing this strategy in the context of an examination or argument regarding a particular adverse expert, you and your own expert must work to show that even if the adverse expert's hypothesis could be arguably true in the case at hand, the hypothesis will not work under other scenarios. In fact, it might even create a danger given those other factual scenarios. For example, if the adversary's expert proposes adding a brace or additional material to one part of a structure to increase rigidity and therefore prevent the accident in question, look to see whether that solution would prevent free movement of another part of the structure. Use strain gauge readings on other loaded parts of the structure to see whether the addition of the bracing, as proposed by the adverse expert, will add additional stresses to other parts of the system. As an example, in a recent roller coaster collapse in Missouri, it was determined that the park's reinforcement of several sections of track prior to the incident to resolve flexing in the track (which is normal) caused the residual stresses in the track system to redistribute themselves, thereby placing more strain in a curved un-reinforced section of the track, causing that curved track section to break when the train passed over it.

B. *In Litigation: an FRE 104(a) Motion*

When one party offers expert testimony, the opposing party must be given an opportunity to challenge that testimony. And once that testimony is challenged, the offering party must be allowed to demonstrate the reliability of its expert testimony. Furthermore, as a "gate keeper" with the responsibility of excluding unreliable expert testimony, trial judges must be given enough time to perform their gate keeping function. In this process, Rule 104(a) motions play a critical role in ensuring that the gate keeping function of the trial judge is adequately performed.

Courts generally require some form of reliability determination before ruling on the admissibility of expert testimony. For example, the Ninth Circuit Court of Appeals reversed the opinion of a trial court that allowed into evidence the testimony of an expert without holding a Rule 104(a) hearing.[31] According to the Ninth Circuit, even though a Rule 104(a) hearing may not be required, a district court must "make *some* kind of reliability determination to fulfill its gate keeping function."[32] In addition, the Tenth Circuit found that a defendant had waived his opportunity to challenge the plaintiff's experts by failing to "make

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[30] Another good source for scientific logical argumentation is THOMAS S. KUHN, THE STRUCTURE OF SCIENTIFIC REVOLUTIONS (1962).

[31] Mukhtar v. Cal. State Univ., 299 F.3d 1053 (9th Cir. 2002).

[32] *Id*. at 1066.

a timely objection before [the] testimony was admitted."[33] In *Macsenti*, the defendant did not object to the expert's testimony when that testimony was admitted during trial. Instead, the defendant objected by filing a motion for judgment as a matter of law at the conclusion of all of the evidence.[34] Therefore, as a procedural matter, to avoid waiving an objection to an adversary's expert testimony, a timely Rule 104(a) motion or similar state court motion should be filed prior to trial.

IV.
THE DAUBERT CRITERIA

A. *Methodology*

Although methodology, as understood by judges acting under *Daubert,* is a very subjective standard, a review of the case law discloses that trial judges really are asking simply whether an expert's reasoning process makes sense. In a recent First Circuit case,[35] the plaintiff's expert in a breach of warranty action merely inspected an outboard motor visually and removed a sparkplug, but did not use any instruments to perform detailed tests. In the reported case, there was no evidence offered that the visual inspection was a well-accepted method of diagnosing the existence of a faulty engine. Nevertheless, the court observed that, "[h]ere, we find it to be a matter of common sense that a visual inspection, including observation of excessive smoke and 'fouled up' sparkplugs, would be one acceptable way for a mechanic or engineer to detect an engine problem."[36]

In another example, a court allowed valuation testimony based upon an admittedly novel theory that combined two conventional approaches, direct sales comparison and income capitalization.[37] The expert's testimony was upheld on appeal because the Court of Appeals for the Second Circuit found that the expert's methodology was sufficiently reliable since the expert had testified several times that the valuation method he used was a "hybrid of two widely-recognized methods." He also testified that this combination was the most appropriate method for valuing the class of property at issue.[38] Thus, even novel methodology can be used and admitted if there is a sound logical basis for employing that methodology.

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[33] Macsenti v. Becker, 237 F3d 1223, 1231 (10th Cir. 2001).

[34] *Id*.

[35] Correa v. Cruisers*,* 298 F.3d 13 (1st Cir. 2002).

[36] *Id*.

[37] FDIC v. Suna Assoc., Inc., 80 F.3d 681 (2nd Cir. 1996).

[38] *Id*. at 687.

In many areas of investigation, professional societies have promulgated methods for undertaking causation investigations. For example, in a New York case,[39] the plaintiff insurance company's subrogation expert on the origin and cause of a fire was challenged with the argument that, under the methodology he employed, the expert could not conclusively demonstrate the cause of the fire. The court ruled, however, that the expert had followed the investigation protocol published by the National Fire Protection Association; it found that this adherence to the protocol rendered his proposed testimony sufficiently reliable and relevant. The court determined that any flaws in the credibility of the analysis would go to weight, not admissibility. In particular, the court held: "[The expert's] testimony was based on his investigation of the fire, an investigation which was conducted in accordance with the professional standards and scientific methodology used by experts in fire and explosion investigations . . . ."[40] It reasoned further that "[i]n developing his hypothesis, [the expert] relied on deductive reasoning, a method recognized as "scientific," and identified all of the potential ignition scenarios."[41] In this case, even though the expert could not conclusively identify the cause of the fire, the court allowed his testimony to stand. After examining all of the evidence, the expert had deduced that molten slag left by the defendant's workers was "most probably" the cause of the fire.[42]

Of course, as stated in *Daubert*, the principal thrust of the methodology argument relates to whether the methodology has been tested. In a recent Fifth Circuit case,[43] the plaintiff's decedent was killed when the single wire rope supporting a conveyor snapped, and the conveyor fell onto her husband. The plaintiff's expert argued that the design was unreasonably dangerous because the conveyor arm was supported by only one wire rope whereas he had seen conveyors with multiple supports, hydraulic supports, outriggers, and stop plates. The court excluded the expert's testimony on the grounds that he failed to test any of these alternatives; seeing other conveyors with other supports did not eliminate the expert's need to test proposed alternative designs since the expert did not have sufficient information regarding the other conveyors he had seen or their intended function.[44]

Given the significant bias regarding the "testing" aspect of the *Daubert* criteria, one approach that should always be taken in refuting an adverse expert's opinion (or in supporting one's own expert's opinion), is to identify a standard test for the procedure that supports

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39 Royal Ins. Co. of Am. v. Joseph Daniel Constr., Inc., 208 F. Supp. 2d 423 (S.D.N.Y. 2002).

40 *Id*. at 426.

41 *Id*. at 427.

42 *Id*.

43 Watkins v. Telsmith, Inc., 121 F.3d 984 (5th Cir. 1997).

44 *Id*. at 992.

the expert's opinion. A very fertile source for such a protocol, (and one almost *never* used by other attorneys), is the ASTM (American Society for Testing Materials) Sub-Committee E 30.11 on Interdisciplinary Forensic Science Standards. This Sub-Committee is under the jurisdiction of ASTM Committee E-30 on Forensic Sciences. For example, ASTM Standard E 678-98 provides a "Standard Practice for Evaluation of Technical Data." ASTM E 678-98, in Section 4, delineates a "Recommended Evaluation Procedure" that includes how to define the problem, and how to identify and validate the hypothesis and evaluation techniques. Section 5 then covers "Data for Evaluation," discussing what data should be included, identifying the source and character of the data, and assessing its validity. Finally, Section 6 describes the opinions that may be reached and how they should be formed.

This same ASTM Sub-Committee E 30.11 also promulgates E 620-04, "Standard Practice for Reporting Opinions of Technical Experts;" E 860-06, "Standard Practice for Examining and Testing Items That Are or May Become Involved in Litigation;" E 1020(6) 2006, "Standard Practice for Reporting Incidents;" and E 1188-05, "Standard Practice for Collection and Preservation of Information and Physical Items by a Technical Investigator." Through the courtesy of and with permission of the copyright holder (ASTM International), abstracts of all of these Standards are attached to this article as Appendix 2, as they appear in the ASTM website.

The ASTM has existed for over a century, and is one of the largest voluntary standards development organizations in the world. It is a not-for-profit organization that provides a forum for the development and publication of voluntary consensus standards for materials, products, systems, and services.[45] It is often valuable to examine historical versions of the standards used in any examination or cross-examination, and these versions can be found on the ASTM website as well. This same website will provide other, more specific standards, if a search is made under the general heading of E 30.11, which catalogues general standards relating to the forensic sciences. No expert would deny that an ASTM testing protocol is good science. In fact, many experts will be ASTM members, and all would agree that since these are *minimum* standards, they should be exceeded. The point is especially compelling when followed by testimony that the expert in question did not follow ASTM standards.

Other professional standards are available and can be identified by experts in a particular field. For example, the National Fire Protection Association publishes NFPA 921, "Guide for Fire and Explosion Investigations," which discusses fire patterns, investigative techniques and other general subjects. In addition, there are several chapters specifically relating to "Legal Considerations" including documentation, cause and origin, and failure analyses. Counsel also should examine the code of ethics that guide any engineering society to which the expert belongs.

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[45] ASTM is located at 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959 (phone: 610-832-9585). ASTM also can be accessed and its Standards ordered on-line at www.astm.org.

It should be noted that several courts have determined that *Daubert* only requires that an opinion be testable; not that it necessarily be tested. A district court recently voiced this interpretation, stating: "[w]hile the plaintiffs place themselves at risk of strong cross-examination, the underlying explanation is not flawed for failure to test an explanation, especially at a cost of $70,000 - 100,000."[46]

This ruling, in fact, falls squarely within Popper's requirement for testing. In his treatise, Popper states:

> I do not demand that every scientific statement must *have in fact been tested* before it is accepted. I only demand that every such statement must be *capable* of being tested; or in other words, I refuse to accept the view that there are statements in science which we have, resignedly, to accept as true merely because it does not seem possible, for logical reasons, to test them.[47]

Remember, however, that hands-on testing is not an absolute prerequisite to the admission of expert testimony based upon the testing criterion. As noted in *Cummins v. Lyle Industries*, the *Daubert* testing can be accomplished in a number of ways, including by review of experimental, statistical, or other scientific data generated by others in the field.[48] Another Seventh Circuit determination cautions that expert testimony should be scrutinized to ascertain whether the proposed testimony assumes the fact that it is offered to prove. In *Clark v. Takata Corp.*,[49] the claim was made that a seat belt improperly unlatched during a vehicle rollover. The plaintiff's expert testified that the seat belt was defective simply because it unlatched, rather than attempting to prove that the belt had unlatched because of the rollover.

V.
PEER REVIEW

Peer review and publication are essential components of any scientific endeavor. However, when faced with an argument that an adverse expert's opinion is valid because it was published in a technical journal, the first avenue of attack should be to review the journal itself and the criteria for publication in that journal. For example, a Nevada court had to decide the weight to be accorded a publication of one of the plaintiff expert's opinions in a peer reviewed journal.[50] The court noted that a distinction had to be made between the

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46 Martin v. Shell Oil Co., 180 F. Supp. 2d 313, 319 (D. Conn. 2002).

47 POPPER, *supra* note 28, at 48.

48 93 F.3d 362 (7th Cir. 1996).

49 192 F.3d 750 (7th Cir. 1999).

50 Valentine v. Pioneer Chlor Alkali Co., Inc., 921 F. Supp. 666 (D. Nev. 1996).

mere publication of an expert's opinions (what the court termed "editorial peer review"), and the true evaluation of the expert's opinions by the outside scientific community (which the court termed "true" peer review).[51]

In essence, the court drew a distinction between publicizing findings so that outsiders can attack or support the conclusions by following the same protocols, and publishing in a refereed journal ("pre-publication peer review"), where review is conducted only by outside reviewers who make confidential comments on the writer's scientific accuracy, style, originality, and importance, and then recommend for or against publication to the journal editors.[52] When this kind of publication or peer review is offered to support an adverse expert's opinions, an investigation into the reviewer's work on the article offered likely will show that the referee spent only a few hours assessing the content of the article.[53]

Another approach taken by some of the more sophisticated but less scrupulous plaintiffs' experts is discussed in *Pick v. American Medical Systems, Inc.*[54] In that case, the court excluded the testimony of most of the plaintiffs' experts notwithstanding the fact that the experts all identified articles they had published in the "International Journal of Occupational Medicine and Toxicology."[55] When this journal was investigated by the defense, they learned that the journal actually charged its contributors for publication of their articles (sometimes described as a "vanity press"). The charge was $48 per page and $65 for each page in excess of fourteen pages. The defense also learned that the journal had a total circulation of only sixty subscribers beyond members of the "society" which published the journal, and a significant number of the subscribers were plaintiff's attorneys. In addition, neither the journal nor the publisher could produce any documents responsive to requests for the identities of the peer reviewers, nor could they produce any comments, notes or edits originating from such reviewers.

In this same case, plaintiffs' experts argued that proof of "true peer review" could be found in the fact that the article had been cited at least eight times since its 1993 publication. In response to the court's inquiry as to whether copies of those citations were available, plaintiff's counsel provided the court with listings taken from a publication known as The Science Citation Index. This is essentially the scientific equivalent of Shepard's Citator and lists citations to previously published scientific articles. However, examination of the citations to the expert's articles in the Science Citation Index revealed that none of his articles

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51 *Id*. at 675.

52 *Id*.

53 Effie J. Chan, Note, *The "Brave New World" of Daubert, True Peer Review, Editorial Peer Review, and Scientific Validity*, 70 N.Y.U. L. Rev. 100 (1995) (arguing that *Daubert's* scientific validity standard requires inquiry into peer review). If that approach seems appropriate for the given case, it would be worth reading the article.

54 958 F. Supp. 1151 (E.D. La. 1997).

55 *Id*. at 1162 n.44.

had been cited in an independent research publication. In fact, the expert himself generated a majority of the citations by referring to his previous work in the subsequent publications. The lesson to be learned here is that counsel should never take peer review and publication at face value. Instead, look behind the impressive title and number of citations to determine the actual nature of the review and publication.

VI.
Potential Rate of Error

The concept of "potential rate of error" should be understood as a corollary of sorts to the concept of testing, because in order to have a database from which an error rate can be computed, the same series of tests or empirical observations must be repeated often enough to provide statistically relevant results. Therefore, if an adverse expert states that an alternative design was tested several times with consistently good results, the court will want to know the testing protocol and the number of repetitions before concluding that the rate of error is acceptable for admission into evidence.

In one familiar case, a rectangular hook retainer was distorted and pulled from the front of a crane when the telescoping boom extended and severely injured the plaintiff, who was standing several hundred feet away. To refute the plaintiff's argument that the weld holding this device onto the crane was bad, an investigation was made into the final shape of the hook retainer, followed by three separate professional analyses. First, a metallurgist made fracture calculations to determine what pull load would be required on the hook retainer to initiate cracking in a perfectly sound weld. The result was fifty thousand pounds. Then, a "Finite Element Analysis" was made to determine what pull load would be required to deform the retainer material to the extent it existed after the incident. The result again was fifty thousand pounds. Lastly, four identical rectangular hook retainer sections were welded onto a plate of the same metal and then pulled until the welds broke free. Astonishingly, in each instance the welds broke at fifty thousand pounds of pull. Moreover, the resulting shape of the four test pieces was precisely identical to the piece that struck the plaintiff. Thus, both the testing and rate of error criteria were met, and the methodology (three separate and distinct methods of analysis leading to the same result) all combined to disprove the plaintiff's theory. The jury retired for only twenty minutes before returning a defense verdict.

VII.
General Acceptance in the Relevant Scientific Discipline

General acceptance in the relevant scientific discipline represents the crux of this entire discussion. Whether admissibility in a given case is governed by the general, decades-old *Frye* rule, or under the *Daubert* rule, it should no longer be sufficient for an expert to simply state for the record that the methodology employed is accepted in his or her discipline. The expert should be made to *prove* this acceptance. And proof of scientific acceptance entails a discussion of how the particular scientific acceptance fits into the various *Daubert* criteria, or perhaps even other criteria, all joined by the common underlying question: "Does this make sense?" Colleges and universities offer courses in pure and symbolic logic. In those disciplines, as in all of science, there are certain rules of logical consistency, which can lead to only one result when followed. In attacking an adverse expert, as in any exercise in logic, look to the expert's basic premise, then look to the sequence of steps used by the expert to move from the basic premise to the conclusion. The focus must be on assessing whether those steps are logically consistent or, more probably, whether a reasoned analysis of the expert's logic can lead to several equally-justifiable conclusions.

VIII.
DAUBERT CRITERIA ARE NOT APPLIED TO WELL-ESTABLISHED PRINCIPLES

Given the foregoing discussion, it is important to note that *Daubert* criteria should not be applied to known fundamental principles. That is, *Daubert* criteria are useful when the relevant principle applied to the case is itself questioned, usually on the issue of causation. However, when the principle applied in the case involves a "well-established principle," such as the laws of gravity or the freezing temperature of water, utilizing the *Daubert* criteria would accomplish little if anything. Actually, the Supreme Court specifically commented on this issue in *Daubert*, noting: "Indeed, theories that are so firmly established as to have attained the status of scientific law, such as the laws of thermodynamics, properly are subject to judicial notice under Federal Rule of Evidence 201."[56] Under FRE 201, a court is obligated in a civil action or proceeding to instruct the jury to accept as conclusive any fact judicially noticed. Even though this approach may not be effective with complex scientific principles, it is appropriate for less complex fundamental principles that are known to the scientific community, since this approach will save time and avoid confusing the jury with additional unnecessary scientific evidence. In short, applying the *Daubert* criteria is a time-consuming process that should be utilized effectively.

IX.
DAUBERT CRITERIA APPLICABLE IN NON-DAUBERT STATE COURTS

A *Daubert*-type cross-examination of expert testimony is often worthwhile, even in a non-*Daubert* state court. In other words, the admissibility of expert testimony can be challenged even in non-*Daubert* states, such as those that follow the *Frye* rule.

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[56] *Daubert,* 509 U.S. at 593 n.11.

A trial lawyer in a *Frye* state may file a motion for a *Frye* hearing to challenge the reliability of an expert's testimony. Beyond that, a trial lawyer can file a Motion in Limine, requesting that the court disallow the introduction of an expert's testimony. In some cases, a trial lawyer's failure to recognize the availability of this valuable tool could prove fatal to a litigation strategy.

For example, in a recent Florida district court case,[57] the plaintiff brought suit against General Motors, claiming manufacturing or design defects in a seatbelt that unlatched when his car rolled over after a collision. The plaintiff's expert testified that "the seatbelt buckle was defective because it was subject to 'inertial unlatch.'"[58] To support his testimony at trial, the expert presented videotape showing how the buckle could release when struck by a hammer or by a hand. General Motors did not object to the expert's testimony, but objected to the videotape, arguing that the tests did not meet the *Frye* standard and that the tests did not replicate real-world conditions. The trial court allowed the videotape to be shown to the jury, and the jury awarded the plaintiff over $8 million. The court of appeals reversed and remanded for a new trial, explaining that when determining whether to admit scientific evidence, a trial court must hold an evidentiary hearing and render a legal decision that the particular scientific principle is generally accepted by a "clear majority" of the relevant scientific community.[59] The trial court had erred by presenting the videotape to the jury without entering such a determination.

In Illinois, a former employee brought suit against Motorola claiming that he had developed a brain tumor caused by testing a prototype antenna for a cellular telephone.[60] In 1984, while conducting field tests for a cellular phone antenna, the plaintiff was directed to place the antenna about one centimeter above his ear. A few days after the tests, the employee developed wetness on his scalp, and in 1992 he was diagnosed with a brain tumor, which was located in the same area where the employee had held the antenna. The employee offered the testimony of two experts, an epidemiologist and a neuropathologist. The epidemiologist testified that the wetness on plaintiff's scalp was evidence of a radio frequency ("RF") burn from the antenna that led to the development of the cancer. Nevertheless, the expert was not aware of any evidence linking an RF burn with cancer. He also admitted that there were no scientific case studies in peer-reviewed literature supporting the claim that RF exposure caused cancer.

The neuropathologist testified that he believed that the RF exposure could cause cancer in humans, but he could not state to a reasonable degree of medical certainty that RF exposure caused human brain cancer. Motorola filed a motion to strike the employee's experts for failing to meet the *Frye* reliability standard, which the trial court granted. The

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57 General Motors Corp. v. Porritt, 891 So. 2d 1056 (Fla. Dist. Ct. App. 2004).

58 *Id*. at 1058.

59 *Id*.

60 Kane v. Motorola, Inc., 779 N.E.2d 302 (Ill. App. Ct. 2002).

court reasoned that the expert testimonies were based on speculation rather than scientific evidence. The appellate court later affirmed, explaining that "courts may reject an expert's conclusions when their extrapolation methodologies are unsound or when the scientific data upon which they rely is not related to the conclusions reached."[61] Thus, an expert must be able to show that the methodologies employed were sound.

Similarly, an opponent's expert testimony can be challenged through a motion in limine. In a Kansas case,[62] a plaintiff brought suit for injuries suffered from her use of the defendant's motorized meat grinder. As the plaintiff was putting meat into the grinder, she glanced away to check on her children. While doing so, her right hand fell into the grinder, resulting in the loss of four fingers. The plaintiff's expert, a safety engineer, was prepared to testify regarding the dangerous nature of the grinder, that the dangerousness was not immediately apparent, and that a user could easily become distracted while operating the grinder. In addition, the safety engineer stood ready to testify that safer grinders with safety features were available.

Before trial, the defendant filed a motion in limine to exclude the plaintiff's expert because the dangerous propensities of the grinder were obvious and easily apparent to the jurors. The trial court agreed with the defendant and granted its motion to exclude plaintiff's expert testimony. The Supreme Court of Kansas affirmed, likewise finding that the operation of the grinder was readily apparent and fully understood by the jury without the necessity of expert opinion. The plaintiff had admitted that it was apparent that if one stuck one's hand down into the grinder, one could be injured. Also, the availability of safer meat grinders on the day of the accident was undisputed. Witnesses adequately described safer grinders, and even the defendant agreed that the plaintiff would not have been injured on the other grinders. Beyond that, there was nothing complicated about the operation or construction of the meat grinder. Therefore, the court found it clear that the expert's testimony was not necessary to describe the dangerousness of the meat grinder or the availability of safer grinders. As the Supreme Court of Kansas stated: "Expert opinion testimony is admissible if it will be of special help to the jury on technical subjects [with] which the jury is not familiar or if such testimony [will] assist the jury in arriving at a reasonable factual conclusion from the evidence."[63]

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[61] *Id*. at 309.

[62] Simon v. Simon, 924 P.2d 1255 (Kan. 1996).

[63] *Id*. at 1259 (quoting Sterba v. Jay, 816 P.2d 379, 388 (Kan. 1991)). Utilizing motions in limine to exclude unnecessary or improper expert testimony not only helps to dismantle the opposing lawyer's trial strategy, it also lessens the possibility of confusion by jurors who would hear the unnecessary expert testimony.

X.
Other Practical Considerations and Guidelines

In a situation involving product liability or patent litigation, whether one is trial counsel charged with educating the judge or jury, a claims professional, or the in-house lawyer or engineer educating the trial lawyer, it is the trial lawyer who will finally link the company with the judge or jury. Because of this unique position, the trial lawyer must be an extension of the engineering department, the marketing department, and the executive office.

To carry out this multi-faceted role successfully, the trial lawyer must become immersed in the design, development, and operation of the subject of the litigation. The trial lawyer must be able to discuss and dissect all aspects of the product or the idea with the engineers and inventors, and above all, the trial lawyer must know the product or the concept better than the opponent's expert.

The traditional defense, when used in a case involving a complex product or technical concept, is overly costly and under-effective for three reasons:

1. Excessive dependence upon retained experts;
2. Inadequate knowledge by the trial lawyer about the technical aspects of the product and its component parts, or the technology involved; and
3. Little understanding by the trial lawyer of how the product, technology, or the concept being offered works or is used.

A product liability jury is rarely convinced by statements that a product is "OK" or "not unreasonably dangerous." The jury must be convinced that a product is the way it is for good reason(s), and the jury must be instructed by counsel as to how and why the product came to be that way.

Before discussing the subject of the litigation with the jury, and even before commencing discovery, it is necessary for trial counsel to go back in time to the beginning, explaining why the product or idea was originally conceived. What was the product intended to do or improve? The trial lawyer must be provided with the original design objectives and performance specifications, and must know how and why they evolved the way that they did over the years. The product's intended use or uses must be listed, as well as its original space and time limitations, and weight and material restrictions. For example, why was it necessary to use titanium instead of stainless steel? Was choice of materials a weight consideration? Was it chemical compatibility? Was it availability? Was it all three or more? A checklist should be developed for the trial lawyer describing the evolution of the product or concept. The list should including all of the above, as well as the following:

- Intended or expected environment
- Foreseeable uses and misuses

- Safety and environmental compatibility
- Regulatory requirements
- National and international standards
- Corporate practices
- Prior and competitive designs and formulations
- Internal and external problem history
- Failure modes (benign, latent, patent?)
- Fail-safe characteristics
- Failure Modes, Effects Analysis, and Fault Tree Analysis
- Warning considerations
- Service and maintenance requirements

The trial lawyer should observe and understand the manufacturing or formulation process, from receipt of raw materials to the end product. If the end product is a mechanical device, the trial lawyer should be able to operate the device and, in some cases, to disassemble and service it. If the end product is a chemical compound or pharmaceutical, the trial lawyer should be conversant with each step in the formulation process and the compounds resulting from each step.

When the trial lawyer is comfortable with the ergonomics of the case, it will be far easier to formulate specific discovery directed to the proper issues, and to explain the significance of these issues to the jury. In order for the trial lawyer to explain the product or idea to the jury in an authoritative and convincing manner, however, the lawyer should be afforded an opportunity to observe how it actually is used in the field. Arrange for a visit to some of the product's larger customers or users. Ask the ultimate user to explain the operation or use to the attorney, and compare that information with the information learned from designers and engineers.

The trial lawyer should have installation manuals, parts manuals, service manuals, and operating instructions at his or her disposal. And, if possible, the trial lawyer should be provided with an exploded parts diagram of all of the essential components in order to visualize how the device fits together. This should include an indented parts list so that the trial lawyer can identify the subcomponents that comprise each individual component part of the overall device. It goes without saying that blueprints and diagrams of the important structures and substructures, as well as assembly drawings, are a necessary part of the trial lawyer's education.

Finally, the lawyer must be shown how the overall device and each subcomponent can be identified as original components. For mechanical devices, one company might use a part number stamped on the metal while another company might employ a color code. For chemicals or pharmaceuticals, the manufacturer may include a benign trace element or other marker. However it is done, when the lawyer is defending the product, she or he must have sufficient information to verify that it is the defendant's product and the defendant's replacement parts, rather than the "Brand X" generic substitute.

In this age of complex technical litigation, it is no longer sufficient to tell the jury why the plaintiff's argument is wrong (if, indeed, that tactic ever was sufficient). Now more then ever, it is necessary to show the jury why the defendant's analysis of the accident scenario is the only viable answer. But the jury will only believe the argument if the lawyer believes it, and the lawyer will not believe it until the lawyer's knowledge of the product or idea is complete.

Only after the trial lawyer has mastered the technology behind the product or idea involved in the litigation is it possible to conduct the investigation and discovery sequentially and in a logical fashion so that the arguments advanced in the case (both plaintiff's and defendant's) are thoroughly challenged early and often. Only after the trial lawyer has mastered the technology behind the product or invention can the lawyer counter the shifts, evasions, and contradictions of the adverse expert(s) during cross-examination, when there is no time to ask one's own expert for an explanation or an alternate line of questioning. Only after the trial lawyer has mastered the sometimes complex and confusing technology involved in the litigation is it possible to explain to the jury in simple, easily understood language, why your side is right. Whether one's trial strategy is based upon "Ockham's Razor" (all things being equal, the simplest of two competing theories is preferable)[64] or Gerry Spence's KISS (Keep It Simple, Stupid), or any other strategy for that matter, if the jury cannot understand the argument, that argument will not win the case.

XI.
Conclusion

As noted early on, the primary function of the advocate in a contested technical case is to educate the trier of fact and the trier of law regarding the underlying physical principles involved. Only then will they understand the logical progression of the advocate's argument. An expert's actual opinions about the cause of an incident probably will take no more than fifteen minutes to deliver. However, it may take a week or more of painstaking groundwork by that expert and others, augmented by the work of counsel who is well-versed in the science or technology involved, to educate the judge and the jury about the subject matter and the technology so that they can appreciate the meaning *and* the significance of those fifteen minutes. Those fifteen minutes are the ultimate goal in any *Daubert* hearing or jury trial, and counsel's understanding of how to get to those fifteen minutes is the ultimate goal of this discussion.

[64] William of Ockham, c.1285 – c.1349, was an English Franciscan friar and scholastic philosopher.

APPENDIX 1

Fifty-State Survey of the Standards Governing Admissibility of Scientific Expert Testimony

STATE	CASE	STANDARD
Alabama	Turner v. State, 746 So. 2d 355 (Ala. 1998); Bagley v. Mazda Motor Corp., 864 So. 2d 301 (Ala. 2003).	ALA. R. EVID. 702 et seq. generally, and ALA. CODE § 36-18-30 (2007) (for DNA); *Daubert* (for DNA admissibility); *Frye* (for all other scientific evidence).
Alaska	State v. Coon, 974 P.2d 386 (Alaska 1999).	ALASKA R. EVID. 702; *Daubert*.
Arizona	Logerquist v. McVey, 1 P.3d 113 (Ariz. 2000).	ARIZ. R. EVID. 702; *Frye*.
Arkansas	Farm Bureau Mut. Ins. Co. of Arkansas, Inc. v. Foote, 14 S.W.3d 512 (Ark. 2000).	*Daubert*.
California	People v. Kelly, 549 P.2d 1240 (Cal. 1976); People v. Leahy, 882 P.2d 321 (Cal. 1994).	CAL. EVID. CODE §§ 720 and 801; *Kelly/Frye* test.
Colorado	People v. Shreck, 22 P.3d 68 (Colo. 2001).	COLO. R. EVID. §§ 702 and 403; May, but need not, consider *Daubert* factors.
Connecticut	State v. Porter, 698 A.2d 739 (Conn. 1997).	*Daubert*.
Delaware	M.G. Bancorporation, Inc. v. Le Beau, 737 A.2d 513 (Del. 1999).	DEL. R. EVID. 702; *Daubert*.
Florida	Flanagan v. State, 625 So. 2d 827 (Fla. 1993).	*Frye*.
Georgia	Moran v. Kia Motors Am., Inc., 622 S.E.2d 439 (Ga. Ct. App. 2005).	GA. CODE ANN. § 24-9-67.1 (2007); *Daubert*.
Hawaii	State v. Fukusaku, 946 P.2d 32 (Haw. 1997); State v. Vliet, 19 P.3d 42 (Haw. 2001).	HAW. R. EVID. 702; *Daubert* (not expressly adopted, but Hawaii courts consider *Daubert* factors).
Idaho	State v. Merwin, 962 P.2d 1026 (Idaho 1998).	IDAHO R. EVID. 702 ; *Daubert* (may be helpful even though not expressly adopted).
Illinois	People v. Basler, 740 N.E.2d 1 (Ill. 2000).	*Frye*.
Indiana	Sears Roebuck and Co. v. Manuilov, 742 N.E.2d 453 (Ind. 2001).	IND. R. EVID. 702; *Daubert* (may be helpful).

STATE	CASE	STANDARD
Iowa	Mercer v. Pittway Corp., 616 N.W.2d 602 (Iowa 2000); Hutchison v. Am. Family Mut. Ins. Co., 514 N.W.2d 882 (Iowa 1994).	Iowa R. Evid. 702; *Daubert* (may be helpful).
Kansas	Kuhn v. Sandoz Pharm. Corp., 14 P.3d 1170 (Kan. 2000).	Kan. Stat. Ann. § 60-456(b) (2006); *Frye* (acts as a qualification to the 60-456(b) standard).
Kentucky	Mitchell v. Commonwealth, 908 S.W.2d 100 (Ky. 1995), *overruled on other grounds by* Fugate v. Commonwealth, 993 S.W.2d 931 (Ky. 1999).	Ky. R. Evid. 702; *Daubert.*
Louisiana	State v. Chauvin, 846 So. 2d 697 (La. 2003).	La. Code Evid. Ann. art. 702 (2006); *Daubert.*
Maine	State v. Irving, 818 A.2d 204 (Me. 2003); State v. MacDonald, 718 A.2d 195 (Me. 1998).	Me. R. Evid. 702; *Daubert* (not expressly adopted).
Maryland	Hutton v. State, 339 Md. 480, 663 A.2d 1289 (1995); Smith v. State, 880 A.2d 288, 304 n.12 (Md. 2005) (stating that Maryland has not rejected *Daubert*).	Md. Rule Rev. Rule 5-702; *Frye* (Maryland has not expressly rejected *Daubert*).
Massachusetts	Palandjian v. Foster, 842 N.E.2d 916 (Mass. 2006); Commonwealth v. Lanigan, 641 N.E.2d 1342 (Mass. 1994).	*Daubert-Lanigan* test (the Supreme Judicial Court of Mass. suggested that general acceptance in the relevant scientific community likely would remain the most important factor in determining reliability).
Michigan	Gilbert v. DaimlerChrysler Corp., 685 N.W.2d 391 (Mich. 2004); People v. Holtzer, 660 N.W.2d 405 (Mich. Ct. App. 2003).	Mich. R. Evid. 702; *Davis-Frye* test.
Minnesota	Goeb v. Tharaldson, 615 N.W.2d 800 (Minn. 2000); State v. Mack, 292 N.W.2d 764 (Minn. 1980).	Minn. R. Evid. 702; *Frye-Mack* test.
Mississippi	Mississippi Transp. Comm'n v. McLemore, 863 So. 2d 31 (Miss. 2003).	Miss. R. Evid. 702; Modified *Daubert*.

STATE	CASE	STANDARD
Missouri	State Bd. of Registration for the Healing Arts v. McDonagh, 123 S.W.3d 146 (Mo. 2003); State v. Daniels, 179 S.W.3d 273 (Mo. Ct. App. 2005) (explaining that Missouri uses *Frye* standard for criminal cases).	MO. REV. STAT. § 490.065 (2007) for civil and administrative cases (the statute differs from FRE 702 in that the statute requires that expert testimony must be "relied upon by experts in the field"); *Frye* for criminal cases.
Montana	State v. Clifford, 121 P.3d 489 (Mont. 2005).	MONT. R. EVID. 702; *Daubert*.
Nebraska	Schafersman v. Agland Coop, 631 N.W.2d 862 (Neb. 2001); State v. Mason, 709 N.W.2d 638 (Neb. 2006).	NEB. REV. STAT. ANN. § 27-702 (2007); *Daubert.*
Nevada	Dow Chemical Co. v. Mahlum, 970 P.2d 98 (Nev. 1998), *overruled in part on other grounds by* GES, Inc. v. Corbitt, 21 P.3d 11 (Nev. 2001); Yamaha Motor Co., U.S.A. v. Arnoult, 955 P.2d 661 (Nev. 1998).	NEV. REV. STAT ANN. § 50.275 (2007); *Daubert* (may be persuasive).
New Hampshire	Baker Valley Lumber, Inc. v. Ingersoll-Rand Co., 813 A.2d 409 (N.H. 2002).	N.H. R. EVID. 702; *Daubert.*
New Jersey	State v. Harvey, 699 A.2d 596 (N.J. 1997).	N.J. R. EVID 702; *Frye* (for criminal cases and a more relaxed standard for civil cases).
New Mexico	State v. Alberico, 861 P.2d 192 (N.M. 1993); State v. Lente, 119 P.3d 737 (N.M. Ct. App. 2005).	N.M. R. EVID. 11-702; *Daubert-Alberico* test.
New York	Collins v. Welch, 678 N.Y.S.2d 444 (Sup. Ct. 1998); Wahl v. Am. Honda Motor Co., 693 N.Y.S.2d 875 (Sup. Ct. 1999), *declined to follow in* DeMeyer v. Advantage Auto, 797 N.Y.S.2d 743 (Sup. Ct. 2005).	*Frye* (for scientific evidence); *Daubert* (for technical or specialized knowledge; court in *DeMeyer* declined to apply *Daubert*).
North Carolina	Howerton v. Arai Helmet, Ltd., 597 S.E.2d 674 (N.C. 2004).	N.C. GEN. STAT. § 8C-1; N. C. RULE EVID. 702; *Daubert.*

STATE	CASE	STANDARD
North Dakota	State v. Hernandez, 707 N.W.2d 449 (N.D. 2005) (declining to adopt *Daubert*); City of Fargo v. McLaughlin, 512 N.W.2d 700 (N.D. 1994).	N.D. R. EVID. 702 (more liberal than FRE 702); *Frye* (state appears to follow *Frye* without an explicit adoption).
Ohio	State v. Nemeth, 694 N.E.2d 1332 (Ohio 1998).	OHIO EVID. R. 702; *Daubert*.
Oklahoma	Christian v. Gray, 65 P.3d 591 (Okla. 2003); Romano v. State, 909 P.2d 92 (Okla. Crim. App. 1995); Harris v. State, 84 P.3d 731 (Okla. Crim. App. 2004).	12 OKLA. STAT. TIT. 12, § 2702 (2006); *Daubert*.
Oregon	State v. Futch, 860 P.2d 264 (Or. Ct. App. 1993), *overruled in part on other grounds by* State v. Howard, 134 P.3d 1042 (Or. Ct. App. 2006); State v. Sampson, 6 P.3d 543 (Or. Ct. App. 2000).	OR. REV. STAT. § 40.410; *Daubert*.
Pennsylvania	Commonwealth v. Crews, 640 A.2d 395 (Pa. 1994); Commonwealth. v. Davies, 811 A.2d 600 (Pa. Super. Ct. 2002).	*Frye*.
Rhode Island	DiPetrillo v. Dow Chem. Co., 729 A.2d 677 (R.I. 1999); Raimbeault v. Takeuchi Mfg. (U.S.), Ltd., 772 A.2d 1056 (R.I. 2001).	R.I. R. EVID. 702; *Daubert* (not expressly adopted but court “endorsed [the] principles”).
South Carolina	State v. Council, 515 S.E.2d 508 (S.C. 1999).	S.C. R. EVID. 702; *Daubert* (though not adopted).
South Dakota	State v. Corey, 624 N.W.2d 841 (S.D. 2001); State v. Guthrie, 627 N.W.2d 401 (S.D. 2001).	S.D. CODIFIED LAWS § 19-15-2; *Daubert*.
Tennessee	McDaniel v. CSX Transp., Inc., 955 S.W.2d 257 (Tenn. 1997).	TENN. R. EVID. 702, 703; *Daubert* (not expressly adopted but useful).
Texas	E.I. du Pont de Nemours and Co., Inc. v. Robinson, 923 S.W.2d 549 (Tex. 1995).	TEX. R. CIV. EVID. 702; *Daubert*.
Utah	State v. Rimmasch, 775 P.2d 388 (Utah 1989); State v. Schultz, 58 P.3d 879 (Utah Ct. App. 2002).	UTAH R. EVID. 702; *Rimmasch* (Utah adopted its own test).
Vermont	State v. Brooks, 643 A.2d 226 (Vt. 1993).	VT. R. EVID. 702; *Daubert*.

STATE	CASE	STANDARD
Virginia	Spencer v. Commonwealth, 393 S.E.2d 609 (Va. 1990).	*Spencer* (Virginia adopted its own test: a more generalized reliability test).
Washington	State v. Riker, 869 P.2d 43 (WASH. EVID. R. 702 1994).	WASH. EVID. R. 702; *Frye.*
West Virginia	Jones v. Patterson Contracting, Inc., 524 S.E.2d 915 (W. Va. 1999).	W. VA. R. EVID. 702; *Daubert.*
Wisconsin	State v. Peters, 534 N.W.2d 867 (Wis. Ct. App. 1995).	WIS. STAT. §§ 904.01, 907.02 (2006) (Wisconsin adopted its own three-part test based on relevance, as opposed to reliability).
Wyoming	Chapman v. State, 18 P.3d 1164 (Wyo. 2001).	WYO. R. EVID. 702; *Daubert*

* *Frye – Frye v. United States*, 293 F. 1013 (D.C. Cir. 1923). The court established a test to determine the admissibility of expert testimony which requires the theory and method used by the expert witness to have been generally accepted within the relevant scientific community.

* *Daubert – Daubert v. Merrell Dow Pharm., Inc.*, 509 U.S. 579 (1993). The Supreme Court, realizing that Federal Rule of Evidence 702 had superseded the *Frye* test, applied non-exclusive factors to determine whether the evidence, which forms the basis for the expert witness's testimony, is reliable and relevant. These factors are: (1) whether the scientific evidence is based on a theory or technique that can be and has been tested; (2) whether the evidence has been subjected to peer review and publication; (3) whether the known or potential error rate and the existence and maintenance of standards controlling its operation are known; and (4) whether it has attracted widespread acceptance within the relevant scientific community.

* *Kumho – Kumho Tire Co. v. Carmichael*, 526 U.S. 137 (1999). The Supreme Court extended the factors outlined in *Daubert* to apply to non-scientific expert testimony that is based on technical or other specialized knowledge.

* *Rimmasch – State v. Rimmasch,* 775 P.2d 388 (Utah 1989). The Utah Supreme Court applied a three-part threshold reliability test to expert testimony based on scientific evidence: (1) whether the principles and techniques are "inherently reliable;" (2) whether the principles were properly applied to the facts of the particular case by sufficiently qualified experts; and (3) whether the prejudicial effect of the testimony outweighs its probative value.

** For further information on the various standards applied by states for the admissibility of scientific evidence, *see* Alice B. Lustre, J.D., Annotation, *Post-Daubert Standards for Admissibility of Scientific and Other Expert Evidence in State Courts*, 90 A.L.R.5th 453 (2004).

\+ Most states have enacted their own Rules of Evidence that are similar to Federal Rule of Evidence 702.

Please note that statutes and case law vary from state to state and may have changed since the publication date of this survey. Further, this survey does not encompass all possible exceptions and nuisances to statutes and case law. In addition, choice of law rules may impact the results in certain cases. To ensure accuracy, check the laws of the subject jurisdiction.

APPENDIX 2

Abstracts of ASTM Standards[65]

Document Summary

ACTIVE STANDARD: E678-98 Standard Practice for Evaluation of Technical Data

Developed by Subcommittee: E30.11

See *Related Work* by this Subcommittee

Adoptions:

Book of Standards Volume: 14.02

1. Scope

1.1 This practice covers the evaluation of technical data, appropriate criteria for such evaluation, and other relevant considerations which constitute a proper basis for the formation of technical opinions in product liability matters. This practice deals with hypotheses and opinions based on consideration and analysis of technical data. While the facts and issues of each situation require specific consideration and may involve matters not expressly dealt with herein, the approach outlined is recommended as good professional practice.

1.2 For additional standards promulgated by ASTM Committee E-30.40 on Technical Aspects of Products Liability Litigation, see Practices E620, E860, and E1020.

2. Referenced Documents

E1020 Practice for Reporting Incidents

E1188 Practice for Collection and Preservation of Information and Physical Items by a Technical Investigator

E620 Practice for Reporting Opinions of Technical Experts

E860 Practice for Examining and Testing Items that Are or May Become Involved in Litigation

Index Terms

Precision; evaluation of technical data (for product liability matters), practice; Product evaluation-litigation or claim; evaluating technical data, practice; Statistical methods; data analysis in product liability claims, practice for technical; experts; Technical experts/investigations; evaluation of technical data (in product liability matters), practice; 07.020; 19.020

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[65] Extracted, with permission, from E678-98 (2006), Standard Practice for Evaluation of Technical Data, copyright ASTM International, 100 Barr Harbor Drive, West Conshohocken, PA 19428. A copy of the complete standard may be purchased from ASTM International (phone: 610-832-9585; fax: 610-832-9555; e-mail: service@astm.org; website: www.astm.org).

Document Summary

ACTIVE STANDARD: E620-04 Standard Practice for Reporting Opinions of Technical Experts[66]

Developed by Subcommittee: E30.11

See Related Work by this Subcommittee

Adoptions:

Book of Standards Volume: 14.02

1. Scope

1.1 This practice covers the scope of information to be contained in formal written technical reports which express the opinions of the scientific or technical expert with respect to the study of items that are or may reasonably be expected to be the subject of criminal or civil litigation.

1.2 If Compliance with this standard is claimed, the justifications for any deviations from this standard must be documented.

1.3 This standard may involve hazardous materials, operations, and equipment. This standard does not purport to address all of the safety concerns associated with its use. It is the responsibility of whoever uses this standard to consult and establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.

2. Referenced Documents

E678 Practice for Evaluation of Technical Data

ISO/IEC 17025 General Requirements for the Competence of Testing and Calibration Laboratories

Index Terms

03.160

[66] Extracted, with permission, from E620-04 (2006), Standard Practice for Reporting Opinions of Technical Experts, copyright ASTM International, 100 Barr Harbor Drive, West Conshohocken, PA 19428. A copy of the complete standard may be purchased from ASTM International (phone: 610-832-9585; fax: 610-832-9555; e-mail: service@astm.org; website: www.astm.org).

Document Summary

ACTIVE STANDARD: E860-97(2006) Standard Practice for Examining And Preparing Items That Are Or May Become Involved In Criminal or Civil Litigation[67]

Developed by Subcommittee: E30.11

See Related Work by this Subcommittee

Adoptions:

Book of Standards Volume: 14.02

1. Scope

1.1 This practice sets forth guidelines for handling of items that may have been involved in a specific incident that is or is reasonably expected to be the subject of criminal or civil litigation.

1.2 The approach outlined is recommended as good professional practice even though the facts and issues of each situation require specific consideration, and may involve matters not expressly dealt with herein. Not every portion of this document may be applicable to every incident or investigation. It is up to the individual preparing the report to apply the appropriate recommended procedures in this guide to a particular incident or investigation. In addition, it is recognized that time and resource limitations or existing policies may limit the degree to which recommendations in this document will be applied in a given investigation. The responsibility of the individual preparing the report (or anyone who handles or examines evidence) for evidence preservation, and the scope of that responsibility varies based on such factors as the jurisdiction, the status of the individual as a public official or private sector investigator, indications of criminal conduct, and applicable laws and regulations.

1.2.1 If compliance with this standard is claimed, the justifications for any such deviations from this standard must be documented.

This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.

Index Terms

evidence collection and preservation; forensic engineers; forensic sciences; 03.120.20

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Document Summary

ACTIVE STANDARD: E1020-96(2006) Standard Practice for Reporting Incidents that May Involve Criminal or Civil Litigation[68]

Developed by Subcommittee: E30.11

See Related Work by this Subcommittee

Adoptions:

Book of Standards Volume: 14.02

1. Scope

1.1 This practice covers guidelines for the collection and preservation of information and physical evidence and the preparation of a documentation report relative to any incident(s) involving personal injury, property damage, commercial loss, or criminal acts which may reasonably be expected to be the subject of litigation.

1.2 The approach outlined is recommended as good professional practice even though the facts and issues of each situation require specific consideration, and may involve matters not expressly dealt with herein. Not every portion of this document may be applicable to every incident or investigation. It is up to the individual preparing the report to apply the appropriate recommended procedures in this guide to a particular incident or investigation. In addition, it is recognized that time and resource limitations or existing policies may limit the degree to which the recommendations in this document will be applied in a given investigation. The responsibility of the individual preparing the report (or anyone who handles or examines evidence) for evidence preservation, and the scope of that responsibility varies based on such factors as the jurisdiction, the status of the individual as a public official or private sector investigator, indications of criminal conduct, and applicable laws and regulations.

1.2.1 If compliance with this standard is claimed, the justifications for any such deviations from this standard must be documented.

Index Terms

Evidence collection and preservation; forensic engineers; forensic sciences

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Document Summary

ACTIVE STANDARD: E1188-05 Standard Practice for Collection and Preservation of Information and Physical Items by a Technical Investigator[69]

Developed by Subcommittee: E30.11

See Related Work by this Subcommittee

Adoptions:

Book of Standards Volume: 14.02

1. Scope

1.1 This practice covers guidelines for the collection and preservation of information and physical items by any technical investigator pertaining to an incident that can be reasonably expected to be the subject of litigation.

1.2 For additional standards promulgated by ASTM Committee E-30, see Practices E 620, E 678, E 860, and E 1020.

1.3 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

E1020 Practice for Reporting Incidents

E620 Practice for Reporting Opinions of Technical Experts

E678 Practice for Evaluation of Technical Data

E860 Practice for Examining and Testing Items That Are or May Become Involved in Litigation

Index Terms

forensic engineers; forensic sciences; 19.020

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FUTURE MEETINGS

2007

ANNUAL 2007

Sunday, July 22 – Sunday, July 29

Sun Valley Resort

Sun Valley, Idaho

WINTER 2008

Sunday, February 24 – Sunday, March 2

Westin Our Lucaya

Grand Bahama Island, Bahamas

ANNUAL 2008

Sunday, July 27 – Sunday, August 3

Fairmont Banff Springs

Banff, Alberta

2008