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The Daubert Deposition Dance: Retracing the Intricacies of the Expert's Steps

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After the decision in *Daubert v. Merrill Dow*,[1] there was some question about whether the gatekeeping responsibilities of the federal trial courts extended to all expert testimony, or merely to "scientific" expert testimony. Even among circuits that believed that only scientific testimony was covered, there was confusion as to what was scientific testimony and what was "technical or other specialized" testimony. The *Kumho Tire*[2] case resolved that confusion, by clearly stating that the methodologies underlying *all* expert testimony must be evaluated for reliability.

This decision therefore clarified the occasions for application of the *Daubert* approach, although it compounded any remaining problems by increasing the number of cases covered. Chief among those remaining problems is the need for trial practitioners and trial courts to develop a coherent

body of analytic tools by which methodological reliability can be measured with some confidence by lawyers and judges without formal training in the specialized fields. For example, how does the trial judge assess the reliability of methodologies employed by the astrophysicist, since it is unlikely that the trial judge coincidentally has been trained in astrophysics.[3]

Although the Supreme Court in *Daubert* and again in *Kumho Tire* emphasized that the four criteria--publication in a peer reviewed journal; known or knowable error rate; general acceptance in the relevant scientific community; and testability or replicability (including the concept of "falsifiability"[4])--were not exclusive (indeed, none of the four is even required), there seems to be some belief among attorneys and judges that we must measure reliability by those criteria alone. In an earlier article,[5] the authors suggested a number of additional, objective criteria that could be utilized in conducting this analysis, beyond those four mentioned in *Daubert*. Abstract criteria, whether four or fourteen, are not easily applied in discovery depositions, however, and we must recognize that it is in deposition that the foundation for challenge to an expert's methodology is uncovered. We therefore thought it might be useful to examine some specific questions that an attorney can ask at deposition to explore these various concepts of reliability, with follow-up and rationale explained as we go along.

1. Publication in a peer-reviewed journal: This criterion of reliability actually has two prongs to it: an article describing the methodology must have been published, which subjects it to scrutiny by whatever readership the journal has; and the article must have been reviewed, pre-publication, by "peers" in the particular field of knowledge, who ostensibly would scrutinize it for errors and challenge any unsupported conclusions. It is objective because it does not require the application of judgment to determine whether it has been satisfied; only examination of the literature. Deposition questions that examine whether this criterion has been satisfied are rather easy to create, but the exercise is useful:

a. *Where has this methodology been published?*

b. *Who published it?*

c. *What is the process for pre-publication review?*

d. *What are the credentials of the reviewers (sometimes called "referees")?*

e. *What criticisms or suggestions did the reviewers make?*

f. *What changes were made as a result of those suggestions?*

g. *What other changes were made?*

h. *What comments were received post-publication?*

i. *What is known of the credentials of those persons providing comments?*

j. *What changes in methodology were made as a result of those comments?*

k. *Have you, or has anyone else, published additional articles on this methodology?*

2. ***Known or knowable error rate:*** This criterion requests the expert to provide information about the likelihood that the methodology will produce incorrect results. It does not establish a threshold of correctness for admissibility, but it is difficult to believe that a court would admit an expert's opinions after hearing *in limine* testimony that a methodology may produce wrong results half the time. In the world of commercial litigation, economists and financial analysts may be the experts most susceptible to challenge based on a failure to satisfy this criterion; in truth, are they able even to assess their error rates when they conclude that a particular market structure is more competitive than another?

a. *Identify studies that have calculated error rates for this methodology.*

b. *Describe how you yourself would determine the error rate.*

c. *What mechanisms are available for reducing or eliminating errors?*

d. *Is there a particular aspect of the methodology (e.g., data collection, data input, interpretation of results) that is more likely to produce errors?*

e. *How would someone employing this methodology know that an error had occurred?*

f. *What types of errors can occur?*

g. *What effect would those errors have on the utility or correctness of your opinion?*

3. ***General acceptance in the relevant scientific community:*** This is the (previously) well-established *Frye*[6] test. The weakness of this test was not that it asked an irrelevant question—the question is indeed relevant—but rather than it depended upon the expert for an opinion on the reliability of the methodology, rather than seeking objective information. As a sole criterion, however, it also assumes that the court could identify the relevant scientific community. Today, with specialists within specialties within sub-areas within practice areas within medical board areas, as an example, the nests of Russian dolls prevent any court from knowing, on its own, whether this is a "relevant scientific community" or a sub-specialty that should be evaluated according to standards from a larger group, or merely a fringe group of radicals. Furthermore, while mechanical engineering methodology may quite reasonably be scrutinized by application of the standards of mechanical engineering, as it was in *Kumho* Tire, we are not so confident that aroma-therapist methodology should be evaluated only by application of the standards of aroma therapists. There is a skepticism here that we recognize and believe to be appropriate, even while we understand that we must be able to distinguish it from mere bias or prejudice.

a. *What evidence is there that practitioners in your field generally accept this approach?*

b. *How do you define your field?*

c. *What other approaches are utilized in that field?*

d. *What approach is utilized most often?*

e. *What are the advantages and disadvantages of the main methodologies?*

f. *Why did you choose to use this methodology?*

g. *When was this methodology developed?*

h. *What effect did introduction of this methodology have on the acceptance of other methodologies?*

4. Testability or replicability: It is not sufficient for a researcher to state that she has discovered a relationship between certain effects and a purported cause. She must specify that relationship in a sufficiently specific way that other researchers can examine it for themselves. If their examinations corroborate her results, then the hypothesis may become accepted. Without such corroboration, however, her hypothesis stands as no better than conjecture. For example, several years ago at the National Heart, Lung and Blood Institute, a researcher noted a statistically significant correlation between people who ate sandwiches for lunch and people who developed serious heart disease. The researcher spelled out his methodology in sufficient detail that other researchers could review his approaches and data; they discovered that sandwiches and heart disease were not directly related to each other, but each was instead related to hurried meal times, a characteristic of Type A personalities at high risk for heart disease because of multiple stress factors. The original researcher's problem of *multicolinearity* would not have been observed if the original hypothesis had not been stated with sufficient specificity to permit test and replication.

a. *Step by step, how have you conducted your tests or examinations?*

b. *Identify all of your data sources.*

c. *Provide all of your laboratory or session notes.*

d. *Beginning with a particular item of raw (empirical) data, show us how it is treated or manipulated by the methodology.*

e. *What tests did you do yourself to confirm that the methodology produced parallel results for parallel inputs? (If your methodology is addition and you input [2, 2] and get 4, then when you input [4, 4] you should get 8.)*

f. *What tests did you do to confirm that disparate inputs would yield disparate results? (If the factor of few firms in an industry is said to lead to high profits, then we should not observe industries with many firms also enjoying high profits. For a simpler analogy, if a friend says that a black box will light a red light when salted pretzels are inserted, it is not a sufficient test to insert salted pretzels and watch for the light; we must also insert unsalted pretzels and stale GummiBear candies and watch for the light. Otherwise, we might merely have a machine (methodology) that turns on a light when anything is inserted.*

5. Development and use of the methodology in non-litigation contexts: *Th*e Ninth Circuit, on remand in the *Daubert* matter, grafted an additional criterion onto the four suggested by the Supreme Court: Was the methodology developed for non-litigation purposes?[7] Questioning on

this criterion should be reasonably straightforward, because it asks the expert for historical facts, not scientific opinions or relationships. If the methodology was developed solely (or, logically, primarily) for the purpose of supporting a particular side in litigation, we are more skeptical about its objectivity.

a. *When was this methodology developed?*

b. *Who was the developer?*

c. *What the original purpose of its development?*

d. *Are you using any modifications that were developed for litigation?*

e. *Why were modifications made to the original methodology?*

f. *Is the methodology still being used for its original purpose?*

g. *Has it been partially or largely supplanted?*

h. *What methodologies have supplanted it? Why?*

6. Sufficiency to explain the salient facts: The Supreme Court in *Kumho Tire* expressed skepticism that a practitioner of a legitimate methodology ("visual and tactile tire failure analysis") could not evaluate whether an apparently salient fact was present (whether the tire had traveled 50,000 miles or more).[8] This does involve the *a priori* belief on the part of the Court that this factor is significant; nevertheless, the expert should at least have been able to provide a reasonable explanation for his inability to determine this fact.

a. *Describe all of the categories of information that were available to you for this analysis (or that are generated by the event being analyzed: profits, margins, gross sales revenue, industry concentration, firm rank, unit sales, advertising-to-sales ratios, advertising expenditure ramps, etc.).*

b. *Rank those categories of data from most to least significant, and explain the ranking.*

c. *Show us where each of those categories was used.*

d. *Tell us why some categories of data were not used.*

e. *Tell us how you adjusted for your inability to obtain some data (e.g., tire travel miles).*

f. *Have you considered different data in other cases? Why?*

g. *Do other researchers consider other data or rank the data differently in importance?*

h. *Have you ever reached conclusions without data from each category?*

7. Quantitative sufficiency of the data employed: In an industrial conveyor belt failure case,[9] the court was concerned that the mechanical engineer was relying on a very small sample to provide data points for his analysis: a few bolts from a very large conveyor assembly. While testimony from someone trained in statistical methods might satisfy the court that the data were sufficient for conclusions at a reasonable level of certainty, the mechanical engineer could not provide that foundation, and the court was uncomfortable with the minimal basis.

a. What were your sources of data?

b. How much data was available from each source?

c. Was there richer data available elsewhere?

d. Was a statistical analysis performed to determine the adequacy of the data for the purpose of drawing conclusions?

e. At what confidence level did the data allow you to draw your conclusions?

f. At what confidence level do you typically operate in non-litigation activities in your profession?

g. In your last published article, what confidence level did you employ?

h. In the last article that you read or refereed, what confidence level was employed?

i. If the data points were increased by a factor of 2, how would the confidence level have been affected? If the points were increased tenfold?

j. If one-third of the data you used were determined to be unreliable, would your conclusions still be sound, at the same level of confidence?

8. Qualitative sufficiency of the data employed: In some cases, we can imagine that the data are quantitatively sufficient (we have enough data points to satisfy the statisticians among us), but we are troubled by the quality of the data or its sources. For example, in child abuse cases, experts sometimes are willing to testify based in part upon their experiences with descriptions of abuse and its sequela from numerous children. The sample may be sufficient in size; even the simple hearsay nature of the bases may be so commonly encountered that it does not disqualify the testimony; but the impressionable nature of the sources—children interviewed under unknown and perhaps uncontrolled circumstances, having been subjected to unrevealed pressures or influences—renders them suspect and may impel a court to exclude the expert testimony.

a. What were the sources of your data?

b. Who collected the data?

c. Who supplied the data to the persons collecting it?

d. *What prior experience have you had with this methodology for data collection?*

e. *What tests did you conduct to determine that your data were accurate?*

f. *What motivations were provided to the sources to encourage accurate reporting?*

g. *Were there any penalties for inaccurate reporting by the sources to your collectors?*

h. *What were the sources told about the purposes of the data collection?*

i. *What were the collectors told about the purposes?*

j. *What were the criteria for including and excluding sources of data?*

9. Consistency with general methodology: Methodologies should be reliable regardless of the context-based biases or prejudices of the persons employing them. For example, the methodology the expert uses to determine the quality of structural steel should be the same, whether that examination is being done as quality control for an industry member, as consultant to a plaintiff in a contract suit, or as consultant to a defendant in a products liability suit. Of course, the general approach should be identified first at deposition, before questioning about specifics; otherwise, the description of what is generally done will be adjusted to match what the witness already said was done in this case. In *Kumho Tire* itself, the Court was interested in the fact that the expert said that his approach involved analysis of four "visual and tactile" aspects of the failed tire and, if any two were present, concluding that the failure was the result of owner abuse rather than manufacturing defect. The expert then found two factors to be present (apparently one just a little bit), but he nevertheless concluded that the failure resulted from defect. This departure from his general methodology may have been fatal to his opinion.[10]

a. *Tell me the steps in using this analysis in your everyday, non-litigation work.*

b. *What are the uses of such analysis?*

c. *What data do you obtain, from what sources?*

d. *Who assists you? Why? How?*

e. *When have you used this analysis before?*

f. *Did you follow the general methodology you have just described?*

g. *In this litigation, what steps do you perform in this analysis?*

h. *Who assisted you? Why? How?*

i. *Was it necessary to depart from the general approach in any way? Why?*

j. *What precautions did you take to insure that those departures would not inappropriately affect the results of the analysis?*

k. *What authority did you have for believing those precautions were sufficient?*

l. *What other steps did you take that were different from your general approach or methodology?*

10. Existence of a body of literature on the particular methodology: If there is no body of literature on the methodology that the expert is recommending, and the explanation for such absence is not apparent or the expert cannot or does not explain the absence of such literature, then the court is justified in exercising skepticism about the reliability of the methodology. (Of course, other factors would be affected also, such as "general acceptance in the relevant scientific community;" how would such acceptance be evidenced if there is no literature?) Of course, if the field of expertise would not be expected to generate such a body of literature ("the adequacy of methods for cleaning tomato sauce spills in supermarket aisles"), the court might well ignore this factor. A faulty syllogism could lead people to believe that, because there is a body of literature on an approach, it represents a reliable methodology; it may merely mean that there are lots of unreliable adherents who write lots of unreliable stuff.[11] The field of astrology, as an example, has generated thousands of books and articles over centuries (or millennia, if Druidic runes qualify).

a. *How does one learn about this methodology?*

b. *How do you keep up with changes and improvements in the methodology?*

c. *What are the principal journals or publications in this field?*

d. *Who contributes to them?*

e. *Who referees or edits them for methodological correctness?*

f. *Do noted scientists contribute or subscribe? (E.g., do astronomers subscribe or contribute to the "Astrologers' Journal"?)*

g. *Do contributors or editors appear in journals of related and accepted fields? (E.g., do astrologers get published in the "American Journal of Astronomy"?*

h. *How long have the main journals in the field been published?*

11. Logical derivation of the methodology: Experience suggests that the scientific progress is, indeed, progressive, that is, new developments build in some recognizable and articulable way on past, related explorations: blood-letting did not lead immediately to heart transplantations; green Post-It™ notes followed yellow Post-It™ notes; and the methods for putting a human on the moon depended upon the development of methods for putting a human in Earth-orbit. As a general, *a priori* principle that makes us comfortable, few steps are skipped. When steps *are*

skipped in such normally evolutionary change, so that it becomes revolutionary, we look for explanations, and we expect the proponent of the new theory to provide those explanations.

a. *Describe the derivation of the methodology that you used.*

b. *What prior methodology is this one most closely related to?*

c. *Describe the similarities between them. Describe the differences.*

d. *Methodology?*

e. *Who were the foremost proponents of the prior methodology?*

f. *Who initiated, sponsored or championed the change to the new methodology?*

g. *What role did you have in this change?*

h. *In what circumstances would the two methodologies yield different results?*

i. *What specific differences in the methodologies lead to those different results?*

j. *Why is the new methodology superior?*

Conclusion

The Supreme Court in *Kumho Tire* emphasized that it would be fruitless to attempt to list all criteria for assessing reliability of experts' methodologies, because they are as numerous as the fields of human knowledge.[12] The purpose of this article is obviously not to disagree with the Court on this point, but rather to suggest ways of thinking about reliability, approaches to assessing methodologies, that can be used across fields of expertise, and that do not depend on requiring the lawyers or the judges to develop competence in the field being assessed. As we consider these legal questions (both the question of how to determine reliability and the questions being suggested here as part of a solution), we are in fact considering questions of much broader application to the human condition: How do we learn? How do we know when we know? How can we learn what someone else *actually* knows? If we were concerned only with the question—trivial, in this context—of determining the credibility of an expert, traditional tools are available: cross-examination, impeachment, learned treatises, omissions, and so forth. Instead, in considering *Daubert-Kumho Tire* issues, we must concern ourselves with the possibility of truth-telling witnesses, armed with patently impressive credentials, whose science may represent the future, but whose testimony should not be presented in court.

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[1] *See* Daubert v. Merrill Dow Pharmaceuticals, Inc., 509 U.S. 579 (1993)

[2] *See* Kumho Tire Co. v. Carmichael, 526 U.S. 137 (1999)

[3] Some suggest that the court could overcome this problem by obtaining its own expert (at the parties' expense, of course). This is not a solution, however, because the question of the reliability of expert methodologies would then legitimately be directed toward the court's expert and her methodologies. Pundits might suggest that another court-retained expert could be consulted, and then another, until we complete some regression back to a Prime Expert.

[4] A premise is "falsifiable" if it can be proven wrong, usually through direct experience. For instance, the premise "all ravens are black" is falsifiable, since it can be proven wrong by the discovery of a white raven. On the other hand, the premise "everything in the universe doubles in size for a second, and then it halves in size the next second" is not falsifiable, since it is impossible to disprove through direct experience. (If everything is alternating in doubling and halving in size, it remains *relatively* the same size, and therefore the difference is impossible to measure.) Scientific premises are tentative and falsifiable, while some other premises are not. It is common for creationists to point out that evolutionary biologists often contradict parts of evolutionary theory. However, the testing of evolutionary theory by its subscribers, which the creationists see as a weakness of that theory, is actually proof positive that the theory is scientific. *See, e.g.,* ROBERT T. PINNOCK, TOWER OF BABEL: THE EVIDENCE AGAINST THE NEW CREATIONISTS, xvi (MIT Press 2000): "Science imposes severe constraints upon itself to ensure that its conclusions are intersubjectively testable, constraints that require that it not appeal to supernatural hypotheses or allow the citation of special (private) revelations as evidence. The new creationists, including Johnson and philosophers such as Alvin Plantinga, reject these constraints and share the view that supernatural explanations should be admitted into science."

[5] *See* David M. Malone & Ryan M. Malone, *The Zodiac Expert: Reliability After Kumho*, 22 THE TRIAL LAWYER MAGAZINE 265 (Fall 1999).

[6] *See* Frye v. United States, 293 F. 1013 (D.C. Cir. 1923).

[7] *See* Daubert v. Merrill Dow Pharmaceuticals, Inc., 43 F.3d 1311 (9th Cir. 1995).

[8] *See* Kumho Tire, 526 U.S. at 254.

[9] Watkins v. Telsmith, 121 F.3d 984 (5th Cir. 1997).

[10] *See* Kumho Tire, 526 U.S. at 254-55.

[11] In order to be certain that we can identify faulty syllogisms, let us look at a correct syllogism and a faulty syllogism:

- Correct syllogism A: (1) All frogs are green; (2) Clyde is a frog; therefore (3) Clyde is green.

- Correct syllogism B: (1) All frogs are green; (2) Clyde is not green; therefore (3) Clyde is not a frog.

- Incorrect syllogism C: (1) All frogs are green; (2) Clyde is green; therefore (3) Clyde is a frog. This is incorrect, because Clyde could be something else that is green but not a frog, such as a pet lime.

- Now, applying this syllogistic template to the Daubert methodology questions:

- Correct syllogism D: (1) Reliable methodologies are likely to generate relatively substantial literature; (2) this is a reliable methodology; therefore (3) it is likely to generate (or to have generated) a relatively substantial body of literature.

- Correct syllogism E: Reliable methodologies are likely to generate relatively substantial literature; (2) this methodology has not generated relatively substantial literature; therefore (3) this is not a reliable methodology (or, even more correctly, this *is not likely to be* a reliable methodology).

- Incorrect syllogism F: (1) Reliable methodologies are likely to generate relatively substantial literature; (2) this methodology has generated a relatively substantial body of literature; (3) therefore this is a reliable methodology.

[12] *See* Kumho Tire, 526 U.S. at 251.