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FRAGMENTING KNOWLEDGE, MISCONSTRUING RULE 702:

How Lower Courts Have Resolved the Problem of Technical and Other Specialized Knowledge in *Daubert v. Merrell Dow Pharmaceuticals, Inc.*

Shubha Ghosh¹

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Introduction

The 1993 Supreme Court decision in *Daubert v. Merrell Dow Pharmaceuticals, Inc.*,² called on federal trial judges to screen out “junk science” by ensuring that an expert’s testimony rests both on a reliable foundation and is relevant to the issue before the court. However, the *Daubert* Court rejected the requirement that the “general acceptance” by the relevant scientific community was necessary for the admissibility of scientific evidence under the Federal Rules of Evidence. Instead, the Court set forth a multiple part test for admissibility. Whether the theory or technique has been subjected to peer review or publication, its error rate, whether it can be tested, and its acceptance within the scientific community, were all factors that were considered in determining admissibility.

Although the *Daubert* decision defined the standard for admissibility of “scientific” expert testimony, the question as to whether this standard should apply to other experts such as engineers, doctors, and economists has remained unresolved. This has led to a split in the standard applied by the federal circuits with some circuits taking a “monist” view, applying the same standard for admissibility to all scientific, technical and other specialized knowledge. Other circuits have taken the “dualist” view and held that the *Daubert* analysis applies only to scientific knowledge and not to technical and other specialized knowledge.

Recently, the Supreme Court heard *Carmichael v. Samyang Tire, Inc.*³ The court considered whether testimony by a tire expert should be admitted in a case involving whether a minivan tire was defective and thus was the cause of a crash which killed one person. In allowing the admissibility of the testimony, the appeals court rejected the trial court’s conclusion that the testimony did not meet the *Daubert* standard. Since the testimony was based upon the personal experience of the expert, it did not have to meet the standard defined in *Daubert* for scientific evidence.

This Article discusses the extent of the circuit split regarding the standard required for admissibility of technical and other specialized knowledge and outlines the importance of defining the correct standard for admissibility of this type of expert testimony. In particular, the standards set forth for the admissibility of “social science” based testimony are reviewed. The Article concludes that the Court should adopt a

² 509 U.S. 579 (1993).

³ See *Carmichael v. Samyang Tire, Inc.*, 131 F.3d 1433 (11th Cir. 1997), *cert. granted sub nom.* *Kumho Tire Co. v. Carmichael*, 118 S.Ct. 2339 (1998).

monist viewpoint and hold that the *Daubert* analysis should apply for all expert knowledge, and not just to scientific testimony. This approach would be consistent with the language of Rule 702 of the Federal Rules of Evidence and with the holding in *Daubert*. It would also avoid the danger of the introduction of junk science into the courtroom.

I. *Daubert* and the Fragmentation of Knowledge

To what types of knowledge does *Daubert* apply? This is the crucial question left unanswered by the United States Supreme Court in its 1993 decision. It is also the question that confronts the Court in *Carmichael* during its next term. Rule 702 of the Federal Rules of Evidence pertains to the admissibility of expert testimony in “scientific, technical or other specialized knowledge.” The *Daubert* Court expressly addressed the standard of admissibility for “scientific knowledge” but expressly left open the question of what standard should be applied to “technical or other specialized knowledge.”⁴ Federal and state courts have been grappling with this question since 1993 with a patchwork of results. This Article describes and categorizes the many splits among circuit and state court decisions on this issue and advocates on the basis of these splits, as well as Supreme Court precedent, that the Court should adopt a “monist interpretation” of Rule 702.

The gravity of the problem of how to interpret Rule 702 can be illustrated with a simple example. A plaintiff is suing an electric company for physical and emotional harm resulting from exposure to electromagnetic fields (“EMF”). She wishes to introduce the testimony of the following experts: (1) a biophysicist to testify on the causal relation between exposure to EMF and cancer; (2) an engineer to testify on the faulty design of the defendant’s lines and generator; (3) a psychiatrist to testify on the psychological effects that result from being diagnosed with cancer; and (4) an economist to testify on the amount of damages. Should any of these experts be permitted to testify?

Prior to *Daubert*, the answer to this question would rest on the standard of general acceptance, as articulated in *Frye v. United States*.⁵ This untailed, one size fits all standard rests on deferring to the judgments of the relevant scientific community

⁴ The Court stated: “Rule 702 also applies to technical, or other specialized knowledge. Our discussion is limited to the scientific context because that is the nature of the expertise offered here.” *Daubert*, 509 U.S. at 590 n.8.

⁵ 293 F. 1013 (D.C. Cir. 1923).

to ascertain scientific validity. If the subject of the expert's testimony was not generally accepted within the relevant scientific community, then the testimony could be excluded.⁶ How general acceptance is gauged is the controversial issue and one of the key issues on which the Supreme Court granted certiorari in *Daubert*.⁷ As applied to the experts at issue in the hypothetical, the trial court in making its determination regarding admissibility would look to see how other biophysicists or medical researchers would regard the expert's testimony. The court would also look to see if other engineers, psychiatrists, or economists would concur with the respective testimonies of the other experts. Although the court may be confronted with quite different standards and viewpoints on what would constitute "knowledge," from a legal viewpoint the *Frye* standard would constitute a "monist standard."⁸ The court's legal

⁶ "Just when a scientific principle or discovery crosses the line between experimental and demonstrable stages is difficult to define. Somewhere in this twilight zone the evidential force of the principle must be recognized, and while courts will go a long way in admitting expert testimony deduced from a well-recognized scientific principle or discovery, the thing from which the deduction is made must be sufficiently established to have gained general acceptance in the particular field in which it belongs." *Frye*, 293 F. at 1014.

⁷ The Court granted certiorari on two issues: (1) whether the general acceptance standard of *Frye* was overruled by Rule 702 of the federal Rules of Evidence and (2) whether peer review is a necessary prerequisite for establishing general acceptance under the *Frye* standard should it apply under Rule 702. Since the Court found that Rule 702 overruled the *Frye* standard, it never reached the second question. *Daubert*, 509 U.S. at 580.

⁸ This conclusion is far from clear, but I adopt it in this paper because it is the most consistent with how *Frye* has been applied. The *Frye* court spoke in terms of experimental process and stages suggesting that it may have intended that the "general acceptance" standard apply only to experimental sciences. However, the court also spoke generally about the problem of gauging the validity of expert testimony: "When the question involved does not lie within the range of common experience or common knowledge, but requires special experience or special knowledge, then the opinions of witnesses skilled in that particular science, art, or trade to which the question relates are admissible in evidence." *Frye*, 293 F. at 1014. Given this conclusion, I perhaps should be asking: "To what types of knowledge does *Frye* apply?" Arguably, given the application of *Frye* to syndrome and other social scientific testimony, the answer is most likely, 'all specialized knowledge.' See Federal Judicial Center, REFERENCE MANUAL ON SCIENTIFIC EVIDENCE 85 (1994) (stating that prior to the 1970's *Frye* was rarely applied outside the area of novel experimental science but citing cases post 1970 in which *Frye* was extended to social science testimony). Finally, given the open ended

standard for admissibility would be the same for all fields of knowledge. Under *Daubert*, the results would be quite different. The Supreme Court left open the question of whether its holding applied to technical and other specialized knowledge as well as scientific knowledge. Several elements of the Court's reasoning, however, would support a monist interpretation. According to the Court, a Rule 702 inquiry entails a consideration of the expert's qualifications, the scientific validity of his testimony, and the fit of the testimony to the specific trial issue. In ascertaining scientific validity, the Court offered the following four guidelines: (1) is the subject of the testimony falsifiable or testable?; (2) is the subject of the testimony derived from techniques with known error rates?; (3) has the testimony been subjected to peer review?; and (4) has the subject of the testimony been generally accepted either in terms of its methodology or conclusions?⁹ The Court's use of the second factor suggests that it may have had more than pure scientific testimony in mind. By referring to techniques, the Court seems to suggest that technical knowledge may also be subject to the *Daubert* factors.

Further support for a monist interpretation is provided by noticing that the expert at issue in *Daubert* was an "epidemiologist." Epidemiology is not a laboratory science in the traditional sense; its methodology is predominately statistical.¹⁰ The conclusions of epidemiologists cannot be tested except for the detection of errors in statistical computation or modeling.

Epidemiological conclusions could be falsified in the sense that facts can be found that would contradict a given conclusion. However, since the conclusions are stated in a statistical or probabilistic manner, true rejection of prior conclusion cannot occur even though statistical refinements are possible. In this way, an epidemiologist studying the spread of disease is no different from an economist studying price fixing in a market, an accountant analyzing financial records, or perhaps a psychiatrist trying to discern mental disorders in a population.¹¹

nature of the *Frye* standard, i.e. "general acceptance," it does not seem inappropriate to construe it as a monist standard.

⁹ *Daubert*, 509 U.S. at 593-94.

¹⁰ "Epidemiology is the study of the distribution and determinants of illnesses, injuries, and diseases, in human populations. In particular, it is concerned with the frequency and prevalence of disabilities in groups of people, and the factors that influence their distribution." Margaret G. Farrell, *Daubert v. Merrell Dow Pharmaceuticals, Inc.: Epistemology and Legal Process*, 15 CARDOZO L. REV. 2183, 2200 (1994).

¹¹ For a discussion of the problem of falsificationism in the context of soft sciences, see Mark Blaug, *THE METHODOLOGY OF ECONOMICS* 21-6 (1992) (identifying

Under the monist interpretation, each of the experts in the hypothetical, the biophysicist, the engineer, the psychiatrist and the economist would have to satisfy the same standard. Each would have to jump the same hurdle and the failure of one to surmount the obstacle would potentially undermine the entire case. Interestingly, *Daubert's* four factors are so broad that even under a monist approach the hurdle as applied may be lower for one expert than another. A monist approach as applied may not in fact be a uniform one, a point returned to in the context of the case analysis.

Although *Daubert* allows for a monist interpretation, the opinion is also consistent with a "dualist interpretation," i.e. a different standard for technical and other specialized knowledge than was articulated for scientific knowledge. The fact that the Court reserved this precise question for future resolution suggests that Rule 702 might require a double standard for knowledge.

Furthermore, the Court's reliance on falsificationism also would militate against monism. Falsificationism, a concept from the philosophy of science associated with Karl Popper, is a method for distinguishing between scientific and non-scientific conclusions based on the ability of rejecting the conclusion as true.¹² For example, the conclusion that the Earth was formed in seven days is a non-scientific one because it can never be disproved through any mechanism that we can devise and agree would be applicable to answer the question. On the other hand, the statement that the Earth is flat is a scientific one because it can be disproved. Furthermore, not only is the statement "the Earth is flat" falsifiable, but it is a statement that has been falsified. By way of contrast, the statement that the Earth was formed in seven days could be true or false; the statement is unscientific from the perspective of falsificationism because we can never disprove it. The Court also spoke about testability more generally, which allowed the Court to include verificationism, or the ability to prove conclusions as true, as the other indicator to discriminate between scientific and non-scientific statements. Many fields of knowledge are not subject to falsifiability or verifiability. Psychiatry would be the principle example. Economics and many other social sciences would be others.¹³

the difficulty of truly verifying or falsifying any proposition in economics or other fields based on statistical inferences because of the existence of background assumptions and joint hypotheses).

¹² For discussions of Karl Popper, see Blaug, *supra* note 10, at 3-27. For a critique of the Court's use of Popper, see Sean O'Connor, *The Supreme Court's Philosophy of Science: Will the Real Karl Popper Please Stand Up?*, 35 JURIMETRICS 263 (1995) (arguing that "falsificationism" is an odd choice as a model of good science).

¹³ "[E]conomic theories should be judged in the final analysis by their implications for the phenomena that they are designed to explain. At the same time,

By choosing testability as the criteria for demarcating science from non-science, the Court could not have meant to simply exclude a substantial field like psychiatry from the purview of Rule 702. Therefore, the Court must have intended to reserve the applicability of *Daubert* to scientific knowledge and leave open the question of other specialized knowledge for another case.

Under the dualist approach, the four experts in the hypothetical would have quite different hurdles to overcome. The height of the hurdles, however, may be hard to predict given silence on what standard would in fact apply to non-scientific knowledge. Ponder the more difficult question of how to determine what expert is speaking for science and which is not. If none are found to be scientific, has the dualist standard then slipped back into a monist one? Or are there further differences to be found among the non-sciences?

Courts have split along monist and dualist lines post-*Daubert*. The Court's reasoning, its disregard in many ways for the methodology of the epidemiological testimony at issue in *Daubert*, and its crude reliance on philosophy of science all foreshadow the confusion as all federal courts and many state courts confront the problem of how to deal with expert testimony that may not be traditionally scientific.

As with *Frye*, the monist approach is a one size fits all standard under *Daubert* which requires the trial court to consider elements of the specific science in determining validity. Under the monist interpretation, *Daubert* differs from *Frye* only in degree with *Frye* dictating complete deference to the scientific community and *Daubert* warranting closer judicial scrutiny.¹⁴ The dualist approach, however, would imply a greater break between *Daubert* and *Frye*. The characteristic of the break will depend largely on which type of dualism one reads in *Daubert*.¹⁵

economics is held to be only a 'box of tools' and empirical testing can show not so much whether particular models are true or false, but whether or not they are applicable to a particular situation . . . Modern economists frequently preach falsificationism . . . but they rarely practice it; their working philosophy of science is aptly described as 'innocuous falsificationism.'" BLAUG, *supra* note 10, at 110-11.

¹⁴ This view is also suggested by Kenneth Foster and Peter Huber, who conclude that "[o]nly time will tell how different the two standards really are in practice. But, as we have discussed, both refer to the criteria that scientists use to grade the quality, reliability and overall validity of claims purporting to reflect scientific knowledge. In *Frye*, the reference was indirect, by means of the surrogate label 'general acceptance.' In *Daubert*, the reference was direct and explicit." Kenneth Foster & Peter Huber, *JUDGING SCIENCE* 228 (1997).

¹⁵ The tension between monism and dualism can be found in the academic

Daubert would support three types of dualism. Dualism Type One would apply to *Daubert* factors to scientific knowledge alone and exclude technical and other specialized knowledge. Under this view, *Daubert* applies only to scientific knowledge but not to the testimony of social scientists or those with technical expertise (such as the engineer or the tire expert). The question remains as to what standard would apply to technical and other specialized knowledge, but the result would be that all such knowledge would be subjected to the same, non-*Daubert* standard.

In contrast, Dualism Type Two would read *Daubert* to apply to hard and soft science but not to applied knowledge. Under this view, both social science and natural science would be subjected to the *Daubert* factors, but applied fields would not be. The economist testifying as to market theories relevant to an antitrust claim would be subjected to *Daubert*; the accountant testifying to damages based on financial data would not. The biophysicist would be subjected to *Daubert*; the doctor not. Again, the question remains as to what standard would apply to the applied field. However, the crux of Dualism Type Two is that hard science and soft science would be subjected to the same standard.

Finally, under Dualism Type Three, there would be a split not only between hard and soft science but also between theoretical and applied versions of each. Not only would the economist and accountant be subjected to different standards, but so

commentary on *Daubert*, advocating that its four factors can be applied (usually with the result of exclusion) to social science testimony. See David L. Faigman, *The Evidentiary Status of Social Science Under Daubert: Is It Scientific, Technical, or Other Knowledge?*, 1 PSYCH. PUB. POL. & L. 960 (1995); David L. Faigman, *To Have and Have Not: Assessing the Value of Social Science to the Law as Science and Policy*, 38 EMORY L.J. 1005 (1989) (urging a monist approach pre-*Daubert*). For a dualist view of social science, see Teresa S. Renaker, *Evidentiary Legerdemain: Deciding When Daubert Should Apply to Social Science Evidence*, 84 CAL. L. REV. 1657 (1996) (advocating that *Daubert* be applied strictly to scientific testimony and not to syndrome testimony). Ms. Renaker's approach is most akin to Dualism Type One, which distinguishes between hard scientific knowledge and all other knowledge. For an example Dualism Type Two (or possibly Dualism Type Three), see Foster & Huber, who write on this point: "A physician who testifies that he or she relied on a standard laboratory test to diagnose a disease in a specific patient is presenting some pure science and some applied knowledge. The scientific proposition is that the test is a reliable, valid indicator of the disease. The technical half of the testimony involves the specific application of the test to a specific patient." Foster & Huber, *supra* note 13, at 311 n.26. Technical knowledge, according to the authors "is subject to *Daubert* only insofar as it implicitly or explicitly relies on more general scientific principles." *Id.* at 13.

would the economist and biophysicist. To call this *dualism* may be stretching the term since this version could quite easily degenerate into an uncentered, pluralistic standard. Knowledge under Dualism Type Three would be divided along two dimensions: hard vs. soft science and applied vs. theoretical. In many cases where the court has adopted a dualistic reading of *Daubert* as applied to technical and other specialized knowledge, the result has been exactly Dualism Type Three, a fact specific determination of what is scientific grounded in a general standard of helpfulness and relevance.

In an analysis of post-*Daubert* cases that have addressed the question of whether *Daubert* applies only to scientific knowledge, there are interesting patterns among the circuits and states. Of the twelve federal circuits, six have adopted a monist interpretation of *Daubert* (the First, the Third, the Fifth, the Seventh, the Eighth, and the D.C. Circuits). The remaining six have adopted some version of the dualist interpretation of *Daubert*. It is unclear which version best characterizes each circuit, but the cases suggest that Dualism Type Three is the most appropriate category. Within each circuit, there are important state-federal splits on this issue. For example, while the Seventh Circuit has adopted a monist interpretation of *Daubert* in interpreting its own rules of evidence, it has also expressly adopted a dualist reading of the case. Within the dualist circuits, West Virginia, Kentucky, Oregon, and New Mexico (each having expressly adopted *Daubert* in interpreting its rules of evidence) have adopted monist interpretations of the opinion. Finally, within the dualist circuits, the states that still utilize *Frye* (including among many others California and New York) ostensibly are still utilizing a monist standard for the admissibility of expert testimony.

Other than serving as curiosum on the influence and spread of *Daubert* and its varied interpretations, there are four principal reasons why these discrepancies and conflicts are important to identify.

1. **Circuit Split.** The circuit split suggests that the issue of how *Daubert* would apply to technical and other specialized knowledge will be before the Supreme Court in the near future. At that point, the court will have to adopt either a monist or some version of the dualist view. The results from the natural experiment of how the lower federal and state courts have addressed the issue as discussed in this Article will guide that decision on how properly to interpret Rule 702. The surprising result is that either choice may lead to the same standard in the following sense. A monist view would ostensibly subject all knowledge to the same standard. As applied, this standard may become watered down and degenerate into a field-by-field standard. A dualist view would also degenerate as courts grapple with the threshold issue of how to classify knowledge as either hard or soft, scientific or technical, or theoretical or applied and the subsequent issue of what standard to apply. The analysis of the cases suggests surprisingly that *Daubert* is perhaps so liberal and flexible that any road taken will lead

to Babel.¹⁶

2. **Summary Judgment.** The admissibility decision under *Daubert* is intimately intertwined with the grant of summary judgment. It is common practice for either the plaintiff or defendant to move for summary judgment and for exclusion of an expert witness simultaneously.¹⁷ The legal theory underlying this practice is that since the proffered witness's testimony does not satisfy *Daubert* and hence cannot be admitted, the nonmoving party cannot meet his burden of proof and summary judgment should be granted to the moving party.¹⁸ This strategy would be exacerbated by a dual standard for *Daubert*. If, for example, an accountant testifying on technical knowledge, then there would be an incentive to use accountants rather than economists as experts even though both may be testifying to the same issue. However, a monist standard could result in too high a standard for admissibility. A study of how courts have interpreted the problem of *Daubert* and technical and other specialized knowledge would highlight these problems.

3. **Forum Shopping.** Splits between federal and state courts on admissibility of expert witnesses provides the basis for forum shopping. Since expert witnesses can determine the outcome of many cases, the forum's rule regarding admissibility under *Daubert* will determine the ease of obtaining a plaintiff's or defendant's judgment. A classic example of this federal-state conflict is offered by New Mexico law. While the New Mexico Supreme Court has permitted economic experts to testify on hedonic damages, a federal district court in New Mexico has expressly held that expert economic

¹⁶ The reference to the Tower of Babel is not to be disrespectful but an allusion to George Steiner, *After Babel* (1977), a philosophical treatise on the problems of translation. Of course scientific testimony is an example of a translation problem, namely, the translation of scientific findings into valid legal evidence.

¹⁷ See Andre Gavil, *After Daubert: Discerning the Increasingly Fine Line Between the Admissibility and Sufficiency of Expert Testimony in Antitrust Litigation*, 65 ANTITRUST L.J. 663, 699-702 (1997). See also Farrell *supra* note 9, at 2208-11 (distinguishing between admissibility and sufficiency questions in the *Daubert* opinion).

¹⁸ As Andrew Gavil expressed it, in this context appellate court's often confuse the question of the admissibility of evidence with its sufficiency with the result that trial court decisions on these dual motions are often judged under the wrong standard of appellate review. Gavil, *supra* note 16, at 703-08.

testimony on hedonic damages fails to meet the *Daubert* standard.¹⁹ The result has been some interesting and predictable strategic battles on choice of forum for various causes of action in tort.²⁰

4. *Daubert versus Frye*. The larger question is whether the transition from *Frye* to *Daubert* has made a difference. The typical complaints about *Frye*, that it was standardless, that it led to a battle of the experts, that it substituted the scientific community's judgment for that of the court's, are not mitigated by a shift to *Daubert*.²¹ In the context of what standards should apply to technical and other specialized knowledge, these problems have been exacerbated. At the outset, the problems may not be eliminated by adopting a monist interpretation of *Daubert* because, as suggested above, this interpretation would more than likely lead to the same result as a dualist interpretation. The underlying problem is one of finding one legal standard for validity of knowledge that can be applied across the varied disciplines of human knowledge. The sole advantage that *Daubert* has over *Frye* in this regard is that *Daubert* allows for judicial scrutiny of knowledge in a way that *Frye* did not.²² The introduction of judicial scrutiny allows for considerations of legal policy and standards as guideposts that the deferential approach of *Frye* ignored. The best solution perhaps is one that treats each discipline of knowledge *sui generis* and allows the trial court judge in its own discretion to determine whether the expert's conclusions and method of deriving conclusions meets a legal standard of adequacy. "What is science?" is not a question left to the experts or a pure question of law, but one of legal fact informed by the need for the testimony and its reliability.²³

¹⁹ Cf. *McGuire v. City of Santa Fe*, 954 F. Supp. 230 (D. N.M. 1996) with *Sena v. New Mexico State Police*, 892 P.2d 604 (N.M. Ct. App. 1995). For a general discussion of court treatment of hedonic damage experts see *infra* Section III.C.3.

²⁰ See *Raynor v. Merrell Pharms., Inc.*, 104 F.3d 1371, 1376 (D.C. Cir. 1997) (distinguishing between admissibility as a question of federal evidence law and sufficiency as a question of state substantive law).

²¹ For a précis on the standard criticisms of *Frye*, see *Foster & Huber, supra* note 13, at 11-16.

²² For the most cogent statement of this view, see Sheila Jassanoff, *SCIENCE AT THE BAR: LAW, SCIENCE AND TECHNOLOGY IN AMERICA* (1995).

²³ Professor Faigman has also advocated the importance of need for the testimony as a factor in admissibility decisions although his approach is more monist than what I suggest here and less grounded in pure policy concerns. See Faigman,

The remainder of this Article demonstrates how these four concerns are implicated in federal and state court resolutions of the intractable question of whether the *Daubert* standards apply to not only scientific knowledge, but also to technical and other specialized knowledge.

II. A Survey of Lower Court Approaches

II.A. The Dualist Approach in Federal and State Courts

Table One presents information on the dualist circuits and states within each circuit.²⁴ As of this writing, six federal circuits have expressly stated that two different standards apply for scientific knowledge and technical or other specialized knowledge.

Of these five, the Ninth Circuit is the only one that has express equivocation on the question, a problem discussed in more detail below. These six circuits represent 30 states, 17 of which have adopted *Daubert* or some version thereof in the interpretation of state evidentiary rules. The remaining 13 have retained *Frye*. Since arguably *Frye* itself is a monist standard, this conflict between federal circuit and state laws poses important federalism and *Erie* issues. Of the 17 *Daubert* states, four have expressly adopted a monist interpretation of *Daubert* in reading their state law, creating further conflicts.

supra, note 14.

²⁴ In constructing both Table One and Table Two, I drew on the work of Heather G. Hamilton, who in a recent volume of *JURIMETRICS* published a table documenting state court adoption of the *Daubert* standard. I have taken information from her table on the status of state evidentiary rules regarding *Daubert* in constructing both Tables One and Two. I corroborated all of her classifications but have not adopted strict interpretations and those that have adopted slight modifications of *Daubert*. The cases reported in the text and in the table were discovered by my own research. See Heather G. Hamilton, *The Movement from Frye to Daubert: Where Do the States Stand?*, 38 *JURIMETRICS* 201 (1998).

FRAGMENTING KNOWLEDGE, MISCONSTRUING RULE 702

Circuit	Standard for technical and other specialized knowledge	Social Science directly addressed?	States within Circuit and approach under state law
2 nd	32 F.3d 19 (look to conventions of field for validity)	Yes, psychiatrist and accountant/economist	Connecticut (D) (N) New York (F) (N) Vermont (D) (N)
4 th	1997 U.S. App. Lexis 24038	Yes, accountant/economist	Maryland (F) (N) North Carolina (D) (N) South Carolina (D) (N) Virginia (D) (N) West Virginia (D) (Monist)
6 th	25 F.3d 1342 (look to qualifications and experience)	Yes, psychiatrist	Kentucky (D) (Monist) Michigan (F) (N) Ohio (D) (N) Tennessee (D) (N)
9 th	122 F.3d 803 ("Facially helpful and relevant")	Yes, psychiatrist, sociologist, economist	Alaska (F) (N) Arizona (F) (N) California (F) (N) Hawaii (D) (N) Idaho (D) (N) Montana (D) (N) Nevada (F) (N) Oregon (D) (Monist) Washington (F) (N)
10 th	82 F.3d 1513 ("facially helpful and relevant")	NO	Colorado (F) (N) Kansas (F) (N) New Mexico (D) (Monist) Oklahoma (D) (N) Utah (D) (N) Wyoming (D) (N)
11 th	131 F.3d 1433	NO	Alabama (F) (N) Florida (F) (N) Georgia (D) (N)

TABLE ONE: DUALIST FEDERAL CIRCUITS

(F): *Frye*; (D): *Daubert*; (Monist): state court adopts monist interpretation of *Daubert*;
(N): state court has not addressed monism/dualism question

An analysis of these federal and state responses focuses on four questions: (1) what was the court's basis for adopting a dualist approach?; (2) what is the court's standard for technical or specialized knowledge that substitutes for *Daubert*?; (3) has the Circuit adopted a standard for the admissibility of social science testimony that is different from that for the admissibility of technical or other specialized knowledge?; and (4) how have state courts dealt with the admissibility of non-scientific experts under their state rules of evidence?

1. **Basis for distinction.** In reaching the conclusion that *Daubert* does not apply to technical or other specialized knowledge, the courts have relied on different emphases of the language in the *Daubert* opinion itself as well as the opinion's underlying policy.

For example, the Second Circuit reversed a district court's exclusion based on its application of *Daubert* factors to the testimony of a geotechnical consultant and an underground construction consultant who were testifying on the feasibility of a construction project. The Second Circuit held that the testimony of these experts did not pose "the kind of junk science problem that *Daubert* meant to address."²⁵ Instead, the experts relied upon "the type of methodology and data typically used and accepted in construction-litigation cases."²⁶ The court did not elaborate on what it meant by "junk science problem" but the context suggests that it meant novel or unaccepted conclusions that are purportedly based in scientific method. The Fourth Circuit adopted a similar approach when it held that the expert testimony of an accountant, concerning baseball salaries and the likelihood that the defendant baseball player would play out his contract, was admissible under *Daubert* despite the appellant's claim that the testimony did not satisfy *Daubert*.²⁷ Such testimony, the Fourth Circuit stated, was not "the type of 'scientific' evidence that must pass *Daubert* muster."²⁸ Once again, the court was unclear as to how it conceptualized "scientific." The context suggests that since the accountant was using standard accounting methods and was qualified, his testimony would assist the trier of fact and therefore was admissible under Rule 702. The reasoning was that *Daubert* implies additional burdens only for testimony that is novel and not based in accepted procedures and methods.

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

²⁶ *Id.*

²⁷ *Davis v. Six Sixteen, Inc.*, No. 96-1238, 1997 U.S. App. LEXIS 24038 (4th Cir. Dec. 12th, 1997).

²⁸ *Id.* at *14.

The Sixth Circuit offers perhaps the most sophisticated, and definitely the most entertaining, rationale for adopting a separate standard for technical or specialized knowledge.²⁹ Based in part on the language of the *Daubert* opinion which, as discussed above, leaves open the question of whether *Daubert* applies to non-scientific experts, the Sixth Circuit also held that knowledge based on scientific expertise is different in kind from technical or specialized knowledge because of the foundation that must be established for introduction of the testimony.³⁰ In the case of scientific knowledge, the foundation must be based on qualifications, training in the relevant methods, and correct applications of those methods. The proper foundation for technical or specialized knowledge on the other hand is a demonstration that the expert has experience in the subject of his testimony. The court illustrated this conclusion with the example of the engineer and the beekeeper, each proffering testimony on the flight pattern of bumble bees. The engineer to the extent that she will present models and engineering data on flight patterns is proffering scientific testimony; the beekeeper's testimony is technical or other specialized knowledge. A different foundation must be provided before either can be admitted. To add to the confusion, the Sixth Circuit also held that the *Daubert* factors apply to all expert testimony in order to ensure the reliability of the testimony.³¹ Although the court distinguished among types of knowledge for the purposes of laying a proper foundation, it did not do so for the purposes of reliability. The Tenth Circuit, by way of contrast, did not rely on beekeeper analogies to conclude that "application of the *Daubert* factors is unwarranted in cases where expert testimony is based solely upon experience or training."³² For such testimony, the district court need only look to the reliability and relevance of the testimony to determine if it is "facially helpful and relevant."³³

The Eleventh Circuit expressly relied on the Sixth Circuit in ruling that *Daubert* applied only to scientific knowledge.³⁴ The court stated that the Supreme Court expressly held that *Daubert* was to apply only to the "scientific context" and not

²⁹ *Berry v. City of Detroit*, 25 F.3d 1342 (6th Cir. 1994), *cert. denied*, 513 U.S. 1111 (1995).

³⁰ *Id.* at 1349-50.

³¹ *Id.* at 1350-1.

³² *Compton v. Subaru of America, Inc.*, 82 F.3d 1513, 1518-9 (10th Cir. 1996), *cert. denied*, 117 S.Ct. 611 (1996).

³³ *Id.*

³⁴ *Carmichael*, 131 F.3d at 1433.

to whenever a witness claimed scientific expertise. Furthermore, while the court acknowledged the gatekeeper function of the district court, it also found that the district court's role as gatekeeper was not intended "as a replacement for the adversary system."³⁵ The court also distinguished *United States v. Lee*,³⁶ its precedent which seemingly held that *Daubert* applied to all expert testimony. At issue in *Lee* was whether the output of a machine that incorporated scientific techniques to detect cocaine on clothing should be subjected to the *Daubert* standard. The Eleventh Circuit stated that "*Daubert* applies not only to testimony about scientific concepts but also to testimony about the actual application of those concepts."³⁷ The *Carmichael* court held that while the *Lee* court concluded that *Daubert* applied its reliability factors to evidence produced by a machine, it did not imply that *Daubert* applied to non-scientific experts.³⁸ This distinction, however, is suspect. The *Lee* court did expressly state that *Daubert* applied to the applications of scientific concepts.³⁹ Furthermore, the *Carmichael* court defined a scientific expert as "an expert who relies on the application of scientific principles, rather than on skill- or experience-based observations, for the basis of his opinion."⁴⁰ The two Eleventh Circuit cases can be reconciled as follows: *Daubert* applies only to scientific experts and machines that are extensions or agents of the scientific expert by embodying methods or techniques of the experts.

The Ninth Circuit has been the most Hamlet-like in determining whether a distinction need be made between scientific knowledge and technical or other specialized knowledge. In its most recent pronouncement, the court held that *Daubert* applies only to scientific knowledge.⁴¹ Its reasoning was based in part on the Court's language in *Daubert* limiting its holding to: scientific knowledge; its own precedent on the issue which looked to the policy concerns of *Daubert* in limiting "junk science"; and on the language of Rule 702 itself which states that an expert may be qualified by "knowledge, skill, experience, training, or education," which are all factors that are extraneous to concerns about the conformance of the expert's methods with those of

³⁵ *Id.* at 1434.

³⁶ 25 F.3d 997 (11th Cir. 1994).

³⁷ *Lee*, 25 F.3d at 999.

³⁸ *Carmichael*, 131 F.3d at 1435 n.5.

³⁹ See text accompanying note 36.

⁴⁰ *Carmichael*, 131 F.3d at 1435.

⁴¹ *McKendall v. Crown Control Corp.*, 122 F.3d 803 (9th Cir. 1997).

science.⁴² Recent dissatisfaction with this conclusion and reasoning has been expressed in dissent by Judge Noonan with regards to the testimony of a child therapist about a syndrome associated with child abuse.⁴³ In concluding that the testimony should have been excluded under *Daubert*, Judge Noonan states that “[t]his Circuit has not been clearly consistent in its reference to *Daubert*,” citing contradictory opinions within the Circuit, some within the same year.⁴⁴ Judge Noonan would clearly subject the testimony of the therapist to *Daubert* (and reject it under the case’s four factors) because it purports to be novel and scientific.

The judge’s dissent illustrates not only the conflict within the Ninth Circuit but also the difficulties with a dualist interpretation of *Daubert*. The most obvious difficulty is one of distinguishing between scientific knowledge and technical or specialized knowledge. None of the circuits adopting a dualist approach have addressed this question at all. Instead, by reading *Daubert* strictly in terms of its language and policy, these five Circuits have held that *Daubert* in some variation applies only to scientific knowledge. Ponder, however, the question raised at the beginning of this Article: is epidemiology scientific knowledge or specialized technical knowledge? How can we tell? This irony in the *Daubert* opinion, the contradiction between the Court’s language about science and the type of knowledge to which it applied the standard, is not addressed by any court let alone those that have adopted the dualist approach.

2. **The standard for technical and other specialized knowledge.** Dualist courts have largely looked to the language and purpose of Rule 702 to devise standards to apply to the admissibility of technical or other specialized knowledge. According to these courts, Rule 702 requires, in addition to the requirements for the admissibility of non-expert evidence, a finding that the expert on technical or other specialized knowledge is qualified either through training, education, skills, or experience in the subject of the testimony and that the testimony will be helpful to the trier of fact. The standard, in other words, is highly contextualized depending upon both the background of the expert and the particular use to which his testimony will be used. As noted above, the Sixth Circuit has an odd variant of this, maintaining the four *Daubert* factors for determining the reliability of scientific and technical or other specialized knowledge but requiring different standards for foundation of the two types of knowledge.

⁴² *Id.* at 805-08.

⁴³ *United States v. Bighead*, 128 F.3d 1329, 1331-9 (9th Cir. 1997) (Noonan, J. dissenting).

⁴⁴ *Id.* at 1335-6.

3. **The treatment of social science.** Further examination of how dualist courts deal with technical or specialized knowledge involves evaluating how these courts specifically dealt with “social science” testimony. A search of the cases for each circuit indicates that none of the five dualist circuits have directly dealt with “social science” testimony. Therefore, an evaluation of how each circuit dealt with psychiatric testimony and economic/accounting testimony was necessary. Of the five dualist circuits, only the Fourth and Tenth Circuits had not dealt directly with the application of *Daubert* to psychiatric experts. The Tenth Circuit also had not directly addressed the testimony of an economist or accountant. The examination of the treatment of experts from the non-hard sciences by the remaining circuits is telling as to how these circuits view “technical or other specialized knowledge.”

The Second Circuit has addressed the admissibility of psychiatric testimony and accounting testimony and subjected each to the helpfulness approach designed for technical or other specialized knowledge. The inquiry in each case was limited to qualifications and ability of the expert testimony to aid the trier of fact.⁴⁵ The Fourth Circuit has adopted a similar approach in reviewing the admissibility of an expert accountant’s testimony.⁴⁶ The Sixth Circuit, which distinguishes between engineers and beekeepers, has considered psychiatric testimony under the “helpfulness standard” that it has fashioned for “technical or other specialized knowledge.”⁴⁷

The Ninth Circuit’s approach to social science testimony is the most intriguing. On the one hand, the court has subjected the testimony of a survey expert with training in sociology and an economist analyzing market structure to the *Daubert* factors.⁴⁸ On the other hand, it has not subjected a range economist testifying on the value of Hopi land to the *Daubert* factors. The results appear schizophrenic.⁴⁹ They can be

⁴⁵ See *Borawick v. Shay*, 68 F.3d 597 (2d Cir. 1995), *cert. denied*, 517 U.S. 1229 (1996) (upholding exclusion of psychiatric testimony that was hypnotically induced); *Morse/Diesel, Inc. v. Trinity Indus., Inc.*, 67 F.3d 435 (2d Cir. 1995) (upholding exclusion of accountant’s testimony regarding damages).

⁴⁶ See *Davis*, *supra* note 26.

⁴⁷ *United States v. Waddell*, No. 93-3982, 1994 U.S. App. LEXIS 16047 (6th Cir. 1994) (excluding testimony of psychiatrist on issue of coercion).

⁴⁸ *Southland Sod Farms v. Stover Seed Co.*, 198 F.3d 1134 (9th Cir. 1997), *cert. denied sub nom. Hale v. Secakuku*, 118 F.3d 1371 (9th Cir. 1997).

⁴⁹ *Masayesva v. Hale*, 118 F.3d 1371 (9th Cir. 1997).

reconciled by considering the court's most recent holding and Judge Noonan's most recent dissent on the *Daubert* issue.⁵⁰ The court has held that the testimony of a product design expert was not subject to the *Daubert* standard.⁵¹ Judge Noonan has suggested that the Circuit's precedent would require applying *Daubert* to the testimony of an expert testifying on essentially psychiatric matters. The seeming confusion within the Ninth Circuit can be reconciled by classifying it as Dualist Type Two jurisdiction.

The Circuit adopts a dualist approach to the application of *Daubert*, but the dividing line is between theoretical and applied science. Thus, psychiatry, economics, or sociology will be treated the same as the hard sciences (i.e., subject to the *Daubert* factors); but technical or applied fields, such as accounting or economic damage calculations, will be subject to the general helpfulness standard.

This resolution is far from satisfactory. For example, the testimony of a survey expert would most logically be classified as applied knowledge, but it was subject to the *Daubert* factors. The division between theoretical and applied is as elusive as that between scientific and technical or other specialized knowledge. Judging from the Ninth Circuit's decisions, theoretical knowledge is abstract and focuses on questions of methods; applied knowledge involves the application of methods to facts.

The dualist circuit's treatment of social science testimony demonstrates the type of dualism each circuit adopts. Due to lack of cases, it is not possible to exactly categorize the Tenth and Eleventh Circuits. However, the Second, Fourth, and Sixth Circuits are clearly Type One Dualists; the Ninth most likely is a Type Two Dualist.

4. **State-Federal Tensions.** Several state supreme courts have also ruled on the applicability of *Daubert* to "technical or other specialized knowledge." Of the states in federal circuits that have adopted the dualist interpretation, a few have adopted a monist interpretation. In addition, since *Frye* is arguably a monist standard, those state courts that still utilize the *Frye* standard pose interesting federalist conflicts in the dualist circuits.

West Virginia, Kentucky, Oregon, and New Mexico have directly addressed the issue of the applicability of *Daubert* to technical or other specialized knowledge and have adopted a monist interpretation. As a result, there is a potential conflict within the respective circuit of each state, namely the Fourth, Sixth, Ninth, and Tenth Circuits. The state court's reasoning is instructive. For example, the West Virginia Supreme Court in adopting *Daubert* stated that "we believe that *Daubert* is directed at situations where the scientific or technical basis for the expert testimony cannot be judicially

⁵⁰ See Bighead, 128 F.3d at 1331-39.

⁵¹ See McKendall, 122 F.3d at 805.

noticed and a hearing must be held to determine its reliability.”⁵² The court went on to exclude the testimony of an expert economist on the subject of hedonic damages. The West Virginia court’s reasoning seems to be based on the general policy parameters of the *Daubert* opinion: its insistence on the trial court’s gatekeeper role which arguably requires a high standard for the admissibility of all expert knowledge, its overruling of the *Frye* standard which itself rested on a monistic standard for the review of science, and its goal to reduce all litigation into a free-for-all involving a battle of the experts.

Kentucky and New Mexico are equally instructive in understanding the monistic view. Both states’ supreme courts read *Daubert* as applying to all knowledge, including technical or other specialized.⁵³ The rationales of each court are not entirely clear but the analysis parallel each other. Both courts refer to the intertwining of the issue of knowledge being scientific with its being reliable, a relationship both courts find militate in adopting a single standard for all knowledge. Both also refer to the principal holding of *Daubert* that *Frye*’s general acceptance standard was overruled by Rule 702 to suggest that a uniform standard is also required under *Daubert*. However, neither court determines the issue as neatly and succinctly as the Oregon Supreme Court which found that “it is difficult to set a more definitive boundary between ‘scientific’ evidence and ‘technical or other specialized knowledge.’”⁵⁴ Practical impossibility, according to the Oregon court, mandates a single standard.

The difficult question is what exactly that standard is. Although all courts repeat the mantra of the *Daubert* factors, it is not always clear how they are being applied. Often the application entails nothing more than looking to qualifications of the expert and the general acceptance of the methods. Sometimes the court is concerned with non-falsifiability of the expert’s conclusions, especially with regards to psychiatric testimony. What ostensibly is a single standard can easily degenerate into multiple standards, with a common core being a cite to the *Daubert* opinion. This author addresses this point once again in the context of monist interpretations in the federal circuits.

What is particularly striking is the conflict between the state and federal standards in the dualist jurisdictions. One’s prediction might be that non-scientific evidence may more readily enter under a dualist interpretation than under a monist one.

⁵² *Wilt v. Buracker*, 443 S.E.2d 196 (W. Va. 1993), *cert. denied*, 511 U.S. 1129 (1994).

⁵³ *Newkirk v. Commonwealth*, 937 S.W.2d 690 (Ky. 1996); *State v. Alberico*, 861 P.2d 192 (N.M. 1993).

⁵⁴ *State v. O’Key*, 899 P.2d 663 (Or. 1995).

For example, the Hawaii Supreme Court permitted testimony of a domestic relations expert under its dualist interpretation of *Daubert*, expressly stating that “specialized knowledge” was subject to a lower standard.⁵⁵ However, monist states also apply a seemingly lower standard towards technical or other specialized knowledge. West Virginia has excluded expert economic testimony on hedonic damages under its monist interpretation but has admitted battered woman’s syndrome testimony. Similarly, Oregon has admitted a wide range of non-scientific testimony under its monist interpretation from testimony about probability of paternity suits⁵⁶ to Horizontal Gaze Nystagmus tests administered by police officers.⁵⁷ New Mexico, in contrast to West Virginia, has admitted economic testimony on hedonic damages under a monist standard while a federal district court in New Mexico has expressly rejected such testimony even under its dualist reading of *Daubert*. The Second Circuit has also managed to scrutinize non-scientific experts under a dualist standard, having excluded the testimony of an accountant and a psychiatrist. Seemingly, *Daubert* is such a liberal and relaxed standard for admissibility that any result is possible despite whether a monist or dualist jurisdiction takes on the opinion. This conclusion is further supported by the consideration of monist jurisdictions in the next Section.

Table Two presents information on monist circuits and states within each circuit as well as references to representative and interesting cases.⁵⁸ As of this writing, six circuits have expressly adopted a monist interpretation of *Daubert*, holding that the *Daubert* factors are to be applied to all categories of knowledge. These six circuits consist of 21 states and the District of Columbia. The District has adopted *Daubert* as its standard for its own rules of evidence as have 14 of the 21 states; the remaining seven retain *Frye*. Although *Frye* itself is a monistic standard for the admissibility of expert testimony, its substantive differences from *Daubert* suggest potential conflicts between state and federal courts in these seven monistic jurisdictions. Surprisingly, in many instances, *Frye* does not give a result that much different from that which would be obtained under an application of *Daubert*. Of the 14 *Daubert* states, three have directly addressed the question of whether *Daubert* applies differently to scientific and technical or other specialized knowledge; of these three, one (Louisiana) has adopted a monistic interpretation consistent with its circuit and two (Indiana in the Seventh

⁵⁵ *State v. Maelega*, 907 P.2d 758 (Haw. 1995).

⁵⁶ *Plemel v. Walter*, 735 P.2d 1209 (Or. 1987).

⁵⁷ *See O’Key*, 899 P.2d at 674.

⁵⁸ *See supra* note 23.

Circuit	Social Science directly addressed? (See text for case cites and analyses)	States within Circuit
1st	Indirectly, since accountant's testimony was at issue	Maine (D) (N) Massachusetts (D) (N) New Hampshire (D) (N) Rhode Island (D) (N)
3rd	Indirectly, since accountant's testimony was at issue	Delaware (D) (N) New Jersey (D) (N) Pennsylvania (F) (N)
5th	Indirectly, since court in dicta said social science was science	Louisiana (D) (Monist) Mississippi (F) (N) Texas (D) (N)
7th	Yes, court expressly says social science is science	Illinois (F) (N) Indiana (D) (Dualist) Wisconsin (D) (N)
8th	Indirectly, since court states that applicability to social science is open issue but finds that psychology meets <i>Daubert</i> factors assuming extended to social science	Nebraska (F) (N) North Dakota (D) (N) South Dakota (D) (N)
D.C.	Indirectly, since court in dicta says <i>Daubert</i> is applied <i>arguendo</i> to economist	District of Columbia (D) (N)

II.B. TABLE TWO: MONIST FEDERAL CIRCUITS

(F): *Frye*; (D): *Daubert*; (Dualist): state court adopts a dualist interpretation of *Daubert*; (Monist): state court adopts a monist interpretation; (N): state court has not addressed monism/dualism issue

Circuit and Iowa in the Eighth Circuit) have adopted a dualistic interpretation. One *Frye* state (Missouri) has addressed the question in dicta and concluded that *Daubert*

mandates a monist interpretation consistent with its circuit.⁵⁹ These data raise the following three questions: (1) what was the court's basis for adopting a monist interpretation when the Supreme Court expressly limited its holding to scientific knowledge?; (2) is *Daubert* applied to scientific and non-scientific knowledge in a consistent manner even in jurisdictions that are ostensibly monist?; and (3) what are the relevant state-federal conflicts on the issue?

II.B. The Monist Interpretation in Federal and State Courts

1. **The Basis for the Monist Interpretation.** The overriding explanation for why some circuit courts have adopted a monist interpretation of *Daubert* is caution.⁶⁰ Courts express hesitancy in parsing the language of Rule 702 too closely especially at the risk of the Supreme Court extending *Daubert* expressly to “technical or other specialized knowledge.” The Third Circuit is the most interesting of the monist circuits because it bases its interpretation of *Daubert* on its own 1985 precedent overruling *Frye* and adopting a proto-*Daubert* standard, which was in part the basis for the Supreme Court's opinion in *Daubert*.⁶¹ In addition to the need for caution, circuit courts also express a need for a uniform standard given the gatekeeper role the Court imposed on district courts in implementing *Daubert* and the provisions of Rule 702.⁶² Dual

⁵⁹ *Schumann v. Missouri Highway & Transp. Comm'n*, 912 S.W.2d 548 (M. Ct. App. 1995).

⁶⁰ *Bogosian v. Mercedes-Benz of North America, Inc.*, 104 F.3d 472, 476 (1st Cir. 1997) (applying the *Daubert* factors to a design engineer); *Moore v. Ashland Co.*, 126 F.3d 679 (5th Cir. 1997), *aff'd en banc*, 151 F.3d 269 (5th Cir. 1998) (construing the *Daubert* opinion as requiring scrutiny of expert's methodology regardless of expert's field); *Cummins v. Lyle Indus.*, 93 F.3d 362 (7th Cir. 1996) (upholding testing and verifiability in review of design expert's testimony since *Daubert* mandates uniform standards for all fields of expertise); *Jenson v. Eveleth Taconite Co.*, 130 F.3d 1287 (8th Cir. 1997), *cert. denied sub nom. Oglebay Norton Co. v. Jenson*, 118 S.Ct. 2370 (1998) (reversing lower court's exclusion of psychiatric expert for failure to apply *Daubert*); *Joy v. Bell Helicopter Textron, Inc.*, 999 F.2d 549 (D.C. Cir. 1993).

⁶¹ *United States v. Downing*, 753 F.2d 1224 (3d Cir. 1985) (adopting a precursor to the *Daubert* standard and applying it to psychiatric expert).

⁶² *See especially United States v. Velasquez*, 64 F.3d 844 (3d Cir. 1995) (applying *Daubert* to testimony of handwriting expert based on need for uniformity and caution in reading *Daubert*). *See also cases cited supra* note 59.

standards create the possibility of loopholes and hence limit *Daubert*'s ability to prevent courts from being deluged by experts. In this regard, monist courts are consistent with *Daubert*'s underlying policy if not its language.

2. Is *Daubert* applied to scientific and non-scientific knowledge in a consistent manner even in jurisdictions that are ostensibly monist?

Despite the monist court's concerns about the need for a uniform standard, many have implicitly adopted a double standard in *Daubert*'s application. This double standard is evidenced by how courts have applied the monist *Daubert* interpretation to fields outside of the hard sciences.

The Fifth Circuit, for example, has recently stated that even under *Daubert*, each field of knowledge needs to be subjected to its own methodological standards.⁶³ Therefore, if testability or falsification is not the part of the method for the expert's field, then neither should they be part of the standard to assess the scientific validity of the expert's testimony. This approach creates obvious problems with categorizing the Fifth Circuit (is it really a dualist jurisdiction in monist clothing?) and perhaps predictability, but offers a more flexible approach to the admissibility of expert testimony. Other circuits have taken a more hard-lined approach, subjecting all expert testimony to the four *Daubert* factors of testability, peer review, known error rates, and general acceptance.⁶⁴

In these circuits, the application of these factors results in a general test for the methodological correctness underlying the expert's testimony. For example, the Seventh Circuit, in excluding the statistical testimony of an expert sociologist, found that the expert's methods did not meet adequate statistical methodology of sample selection and inclusion of control variables.⁶⁵ The First Circuit subjected the testimony of a financial accountant to the standard of his own profession as well, although it cited *Daubert*'s four factors.⁶⁶ These cases indicate that even hard-lined circuits actually apply a dual standard similar to that applied by the Fifth Circuit.

⁶³ See Moore, *supra* note 59.

⁶⁴ See cases cited *supra* note 59. See also *Wintz v. Northrop Corp.*, 110 F.3d 508 (7th Cir. 1997) (discussing broad reach of *Daubert*); *Tyus v. Urban Search Management, Inc.* 102 F.3d 256 (7th Cir. 1996), *cert. denied*, 117 S.Ct. 2409 (1997) (discussing applicability of *Daubert* to social science).

⁶⁵ *People Who Care v. Rockford Bd. of Educ.*, 111 F.3d 528 (7th Cir. 1997).

⁶⁶ *Ed Peters Jewelry Co. v. C&J Jewelry Co.*, 124 F.3d 252 (1st Cir. 1997).

3. **State-Federal Conflicts in Monist Circuits.** Louisiana, in adopting a monist interpretation of *Daubert*, justified its interpretation on the grounds of gatekeeping and statutory interpretation; those grounds are similar to those used by the monist circuits.⁶⁷ The two dualist circuits each offered different rationales. Indiana pointed to its own precedent, much of it pre-*Daubert*, to hold that separate standards were required for scientific and technical or other specialized knowledge.⁶⁸ Iowa adopted a literal reading of *Daubert* and relied on persuasive authority from dualist jurisdictions like the Ninth Circuit for adopting a double standard.⁶⁹ Interestingly, Louisiana excluded the testimony of a psychiatrist on Child Sexual Abuse Syndrome on the grounds that such testimony is not falsifiable. The Iowa court, applying its dualist interpretation, admitted the testimony of a psychiatrist on Obsessive Compulsive Disorder. The Indiana court, also using a dualist standard, excluded the testimony of a hair sample analyst. For reasons discussed above, it is difficult to conclude whether the dualist or the monist interpretation is the more permissive standard.

II.C. Legal Schizophrenia in the Land of Babel: Wither Daubert?

The uncertainty over the appropriate standard for technical or specialized knowledge exacerbates the overarching problem of whether the Supreme Court adopted the correct standard to replace *Frye*. Furthermore, the added confusion over what standard to apply to “non-scientists” illustrates, however, some of the problems created by *Daubert*. Does *Daubert* perform better than *Frye*? The answer will depend upon whether *Daubert* is applied in a substantively different manner from *Frye*. This author’s belief is that except for the added judicial scrutiny introduced by *Daubert*, the two standards are practically identical. *Daubert* invariably will fall back on the same deference that *Frye* gave to the scientific community at the level of methodology rather than in conclusions. What is perhaps even more surprising is that this is true regardless

⁶⁷ *State v. Foret*, 628 So. 2d 1116 (La. 1993) (excluding child abuse expert under monist interpretation of state’s version of Rule 702).

⁶⁸ *McGrew v. State*, 673 N.E.2d 787 (Ind. Ct. App. 1996), *aff’d in part, vacated in part*, 683 N.E.2d 1289 (1997) (adopting a dualist approach because Indiana’s version of Rule 702 mentions only “expert scientific testimony” and therefore hair analysis subject to general helpfulness standard rather than *Daubert* factors).

⁶⁹ *Johnson v. Knoxville Community Sch. Dist.*, 570 N.W.2d 633 (Iowa 1997) (admitting testimony of neuropsychiatrist on Obsessive Compulsive Disorder under general helpfulness standard).

of whether courts adopt a dualist or monist reading of *Daubert*.⁷⁰ The *Daubert* opinion has been compared to Pandora's box.⁷¹ Perhaps a more apt analogy is the opinion was intended to be a dike designed to prevent courts from being flooded by "junk science." By not addressing the problem of technical or other specialized knowledge, the Supreme Court left open a big fissure in this dike for lower courts to fix in a piecemeal fashion.

The remainder of this Article suggests how the problem can be resolved.

III. Understanding and Expanding *Daubert's* Definition of Science

III.A. Experience and Expertise: Is Social Science a Science Under Daubert?

The *Daubert* court's opinion illustrates that there are at least two types of knowledge that can be the basis for either lay or expert witnesses. The first is direct sense experience, derived from actual presence at the event in question or from inferences from such events. Therefore, a lay witness can testify that the moon was full on a certain night creating a reasonable inference about luminescence. An expert witness's testimony about the relationship between moon phases and light would also be helpful but arguably cumulative. Knowledge can also be derived through a methodological filter. A potential witness has studied some phenomenon and is distilling conclusions relevant to issues, for example, of causation, mental state, or damages. In this latter case, experience is filtered through a system of knowledge and the relevant testimony pertains to the conclusion or the links between the sense data and the conclusions. The *Daubert* court concluded that when testimony has been purportedly filtered through scientific methodology, trial court judges should fulfill a gatekeeper function to ensure that the correct filter has in fact been used.

In terms of understanding the application of *Daubert* to economic and other

⁷⁰ In this regard, see Foster & Huber who wrote: "When all is said and done, a great number of judges applying the new terms will end up making calls very similar to those they would have made under *Frye* . . . [In *Daubert*], a new phrase -- 'scientific knowledge' -- had replaced 'general acceptance.' But that narrow conclusion did not define what 'scientific knowledge' means. Nor did it determine the extent to which 'scientific knowledge' and 'general acceptance' overlap." Foster & Huber, *supra* note 13, at 226.

⁷¹ See O'Connor, *supra* note 11, at 276.

social science testimony, the difficult threshold question is: which of these two categories does the testimony fall in? For example, if the testimony is about an actual industry or an actual market, an expert economist may be able to testify based upon her direct observations of the industry or market, observations obtained through financial statements, market statistics, and interviews. However, such testimony arguably has also been taken through a filter. If the economist's experience with the industry has been largely through the collection of statistical data, then the data must have been filtered through some technique in order to generalize principles. If the former characterization is appropriate, arguably *Daubert* does not apply; if the latter is appropriate, then *Daubert* should be applied. The correct application of *Daubert* hinges on the prior categorization of the testimony as either scientific in the sense of knowledge acquired through a specialized filter or experiential factors. The distinction becomes more subtle in contexts such as hedonic damages. Economists arguably have no greater experience in valuing life than the lay person; every individual has a sense of how to value an individual life. In this way, expert testimony about value of life may not even be helpful to the trier of fact under a Rule 402 standard for relevance. On the other hand, economists may be expert at valuation, i.e. aggregating data about prices into a measure of value. If economists can value businesses, existing or to be formed, then economists should be able to develop a methodology about how to aggregate information about an individual person, such as education, occupation, and other characteristics, into a number that would provide a value of an individual person's life. Under this characterization, knowledge about value of life is filtered through specific economic and statistical methodology, which is subject to *Daubert* analysis. Whether the court applies the correct *Daubert* analysis is another issue. The question here is, at the threshold, what standard to apply to economic and social science testimony.

The application of *Daubert* to economic and social science testimony is complicated by the excluded middle in the *Daubert* court's reading of Rule 702. As the Court states in a footnote, "Rule 702 applies to 'technical or other specialized knowledge.' Our discussion is limited to the scientific context because that is the nature of expertise offered here."⁷² Knowledge that is technical or specialized is in the gray area between purely experience based knowledge and scientific knowledge. Filters may be at work in the acquisition of technical or specialized knowledge, but of a different sort than for scientific knowledge. A mechanic will look at an engine in a way that is different from the lay person; similarly, an electrician will process and analyze a circuit differently from the average owner of a radio. Each will differ respectively from how a physicist would view the same data. The *Daubert* opinion seems to suggest that the *Daubert* analysis will depend upon whether we characterize the particular expert witness as being technical or scientific.

⁷² *Daubert*, 509 U.S. at 590 n.8.

The distinction, if one were to try to articulate it more precisely, is seemingly one between: applied and theoretical knowledge; knowledge based on experience at a higher level of expertise than the lay person and knowledge; and knowledge based on a clearly well-defined methodology. However, here once again, the Court's analysis would take us not only to a gray area but also one that would be circular. Scientific knowledge is to be distinguished from technical knowledge based on the use of the correct methodology; incorrect methodology would foreclose the admissibility of non-scientific technology. Could such testimony not be characterized as technical at the threshold by the party seeking to introduce it and therefore escape *Daubert* analysis altogether? The excluded middle in *Daubert* is knowledge not acquired either through a rigorous scientific methodology or lay experience. Lower courts have been divided on the proper approach in ruling on the admissibility of knowledge in the gray area; some have wholeheartedly applied the *Daubert* standard leading to such results as the exclusion of a tire expert's testimony concerning skidmarks and an auto mechanic's testimony concerning the manufacture of engines because such testimony was not scientific.⁷³ Other courts have not excluded such testimony for failure to be scientific under *Daubert* and instead have subjected such testimony to the usual test of reliability, materiality, competence, and relevance.⁷⁴

The difficult issue is whether economics and other social science testimony should simply be recharacterized as "technical or other specialized knowledge" rather than "scientific knowledge" for the purposes of determining admissibility. Such recharacterization would obviate any problems that courts are currently having with the scientific status of economic and social science testimony. There would also be a basis both in the nature of economic and social science testimony and in legal precedent for such re-characterization. Testimony of a statistical disparity based on gender or race is not based on an explicit scientific methodology in the same way that clinical trials of a drug indicate some effect on cancer rates. Instead, the expert, whether trained in sociology or economics, is testifying about what the statistics indicate. The conclusions drawn from analysis of the statistics is technical rather than processed through the filter of a scientific method.

The distinction is memorably drawn, though argued below fallaciously, by the Sixth Circuit in *Berry v. City of Detroit* between the beekeeper and the aeronautical engineer.⁷⁵ If a party in a lawsuit were seeking testimony about the mechanics of how

⁷³ See Preston Lerner, *A New Breed of Hired Guns*, THE WASHINGTON MONTHLY 8 (April 1997). See also discussion in *supra* Section III.

⁷⁴ See, e.g., *McKendall*, 122 F.3d at 803; *Compton*, 82 F.3d at 1513.

⁷⁵ 25 F.3d 1348-50.

a bumblebee flies, he could use the testimony of the aeronautical engineer whose training in physics would clarify the principles of bumblebee flight. On the other hand, if a party were seeking testimony about the flight patterns of bumblebees, e.g., where they fly, in what patterns, and in what manner, he would rely on the testimony of the beekeeper whose direct experience observing and studying bumblebees would provide the adequate foundation for such testimony. The Sixth Circuit concludes, in a holding that the Ninth and Tenth Circuits found persuasive, that *Daubert* applies only to the testimony of the aeronautical engineer and not to that of the beekeeper.⁷⁶ The characterization of knowledge as either scientific or technical, or neither of these two, is an issue of foundation. What is the basis for the witness's testimony: specialized training or direct experience? Put another way, what is the filter through which the witness is processing and producing his testimony? As applied to economists and to other social scientists, are they beekeepers or engineers? The answer to these questions will determine the proper gatekeeper role of the judiciary under *Daubert*.

Having laid out the excluded middle in *Daubert* and its treatment by lower courts, this author emphasizes that for many reasons, the approach of the Sixth Circuit in *Berry* and modifications of its essential holding by other circuits is erroneous and potentially damaging to the purposes of *Daubert*. The *Berry* court's division of experts into either beekeepers or engineers treats non-scientific experts like lay experts. If a lay expert were to testify on the flight patterns of bumblebees, a proper foundation would have to be laid for his testimony. Would experience watching bees for a hobby qualify as a proper foundation? Would experience being stung on many occasions qualify? Attending picnics? The *Berry* court recognizes that the title of beekeeper may make a witness an expert on bee flight patterns but the court looks to experience as the main criterion for foundation. If experience is required for laying a foundation, then the expert beekeeper is no better than the lay person who has simply "watched a lot of bees." In effect, the court is taking the language of "technical or other specialized knowledge" out of Rule 702 and applying the specialized rules for expert witnesses to scientific testimony alone.

A kinder reading of *Berry* would be that there are two classes of experts, scientific and non-scientific. While the heightened scrutiny is required for both classes of experts, the *Daubert* standards would only apply to the former. This reading would preserve the text of Rule 702 and the distinctions in the Federal Rules of Evidence between lay and expert witnesses (as opposed to lay and scientific experts as the *Berry* decision would demarcate). However, this reading would be equally unsatisfying for the very reasons articulated above: what is the threshold definition of "science" and "scientific" for the court to apply? If the threshold definition of scientific is one that is based on methodological correctness and if exclusion is based on failure to comport

⁷⁶ See, e.g., *McKendall*, 122 F.3d at 803; *Compton*, 82 F.3d at 1513.

to methodological correctness, then the decision to characterize certain testimony as scientific rather than technical becomes determinative as to admissibility. Admittedly, the questionable issue here is the levels of generality in the inquiry. For the threshold question, the court must look to see if the source of the testimony is a field which purports to apply a scientific methodology; the question of exclusion is whether the testimony conforms to the scientific methodology used by the field. For example, as applied to the question of the admissibility of the testimony of an aeronautical engineer, the threshold question is whether aeronautical engineering is a science; the admissibility question is whether this specific expert's testimony was derived from the methodology of aeronautical engineering. However, when phrased this way, is *Daubert* any different from *Frye*? Has the *Daubert* standard simply replaced *Frye*'s general acceptance standard as applied to an expert's testimony with a general acceptance standard as applied to the expert's methodology? As applied to economic testimony, especially in the area of antitrust, the answer is seemingly yes. Distinctions between scientific and technical knowledge will only exacerbate the problem.

The *Berry* court's reading of Rule 702 adds another step to the application of *Daubert*, namely an inquiry into whether the proffered testimony is scientific or technical. This added step not only confuses the *Daubert* analysis because it creates the need to make ungrounded distinctions as well as creates the possibility of strategic maneuvering by the parties to the lawsuit in how the testimony is characterized. The distinction creates a class of non-expert experts; witnesses can don titles (such as "beekeeper") but whose testimony will be scrutinized on a basis no different from any lay witnesses. Parties would rather hire the beekeeper than the aeronautical engineer in order to avoid the problem of having to lay a proper foundation of valid scientific methodology for admissibility. Such incentives may be desirable from the perspective of lowering the costs of litigation; presumably beekeepers are cheaper to retain than aeronautical engineers. However, from the perspective of developing law and providing a well-informed basis for legal decisions, the switch to a different caliber of witness would not be desirable and would undercut the goals of keeping junk science out of the courtroom. The return would ostensibly be to the *Frye* regime which is more permissive of junk scientific testimony. Even if in many cases the aeronautical engineer would be the preferred witness and cannot be rejected by the parties in favor of the beekeeper, the *Berry* court's distinction would create incentives for re-characterization of witnesses as technical rather than scientific at the threshold. Even if such maneuvering would have a *de minimis* effect on the costs of litigation, such re-characterization may have an effect on the court's gatekeeper role as parties present witnesses whose testimonies are grounded not in scientific method but in experience and observation.

The ultimate problem with *Berry* and its progeny, however well grounded they may be in the reading of *Daubert*, is that they fail to recognize the principal reason for why the Federal Rules treat lay and expert witnesses differently. As the *Daubert* court

itself suggests in its example of testimony pertaining to phases of the moon, expert testimony is filtered through a method and technique unfamiliar to the lay person while lay testimony arises from ordinary experience, e.g., the filters presumably we all share as homo sapiens of a particular culture and history. The beekeeper, too, has a filter which is different from the lay person who experiences bees through picnics and the occasional sting. The filter is also different from that of the aeronautical engineer. Because the beekeeper's testimony is derived through a filter different from that of ordinary experience, the trial court should scrutinize the filter as the *Daubert* decision mandates it to do.⁷⁷ The problem is whether the court should apply the same standards for the beekeeper's filter as it would apply to the filter of the aeronautical engineer. An even more difficult problem is whether the court can apply different standards for the beekeeper and the engineer without opening the court room door to all experts and reducing the *Daubert* decision to a reconstitution of *Frye*. These problems are addressed and resolved in the next Section in the context of economic and social science testimony. The key is not to change the law or break with precedent but to understand science and scientific knowledge in a more methodologically sophisticated way.

III.B. Recognizing Social Science Under Daubert

Neither the *Daubert* court nor the various amici addressed the issue of the applicability of *Daubert's* scientific validity standard to social science.⁷⁸ At issue in

⁷⁷ Peirce had a very expansive notion of science which would include not only experimentalists and theoreticians but also practicing artisans. As Peirce states: "Such is the method of science. Its fundamental hypotheses, restated in more familiar terms is this: There are Real things, whose characters are entirely independent of our opinions about them; those Reals affect our senses according to regular laws, and, though our sensations are as different as our relations to the objects, yet by taking advantage of the laws of perception, we can ascertain by reasoning how things really and truly are." Charles Peirce, *The Fixation of Belief*, PHILOSOPHICAL WRITINGS OF PEIRCE 18 (Justus Buchler ed.) (1955). The breadth of his notion of science is apparent from this quotation. At one level of generality, science is any activity that involves interaction between the mind and the world. At another, science involves perception and experience. Peirce attempted to create a taxonomy of all the sciences which for Peirce included Mathematics, Philosophy, and Logic as well as Art or Applied Science. See Beverly Kent, CHARLES S. PEIRCE: LOGIC AND CLASSIFICATION OF THE SCIENCES 94-107 (1987).

⁷⁸ The phrase social science does not appear in the *Daubert* opinion and there is no Supreme Court opinion directly on point regarding the applicability of *Daubert*

Daubert, and in the amici briefs submitted, was the narrow question of whether publication was a necessary prerequisite for admissibility under Rule 702. The answer to this narrow question given by the Supreme Court was no. Publication was not necessary for admissibility nor was failure to publish sufficient for exclusion.⁷⁹ Instead, the trial court judge should look to the methodological validity underlying the testimony. In order to understand the question of how *Daubert* should be applied to social science, we should address a more basic question: who won in *Daubert*? In a narrow technical sense, Merrell Dow won because upon remand, the Ninth Circuit applied the *Daubert* principles and still held that the expert testimony should be excluded.⁸⁰ In a broader sense, however, it is unclear whose view of science really was victorious. The Court did reject the Ninth Circuit's holding that publication was necessary for admissibility, the position adopted by many of the amici for *Daubert*. On the other hand, of all the amici, the Court cited the brief from the National Academy of Science ("NAS"), writing on behalf of Merrell Dow. The NAS brief urged the Court to defer to the scientific community much like the Ninth Circuit had done. However, the Court adopted the NAS brief only to the extent that it provided a view of scientific method and validity that was generally accepted by the scientific community. The *Daubert* decision, as delineated in the previous Sections, did not adopt a standard requiring deference to the scientific community by the trial court judge. With respect to the findings of the scientific community, *Daubert*'s standard is essentially *de novo* whereby the Court reviews the testimony for scientific validity using the scientific community's guideposts, e.g., using factors such as publication and peer review.

The *Daubert* court's treatment of natural science has strong implications for social science depending upon the level of generality at which the *Daubert* opinion is read. At one level, the opinion is holding that scientific validity should be gauged by general acceptance within the scientific community. The holding differs from that of *Frye* only in focus. While *Frye* required the judge to inquire as to whether a particular

to social science. Many lower courts have held that *Daubert* does apply to the testimony of economists and other expert social scientists. See cases discussed in Section II, *supra*. The most recent (as of this writing) case to hold that *Daubert* applies to social scientist testimony is *United States v. Hall*, 974 F. Supp. 1198 (C.D. Ill. 1997), *aff'd*, U.S. Dist. LEXIS 592 (7th Cir. Jan. 19, 1999) (holding that *Daubert* is applicable to the testimony of a social psychologist).

⁷⁹ "The fact of publication (or lack thereof) in a peer reviewed journal thus will be relevant, though not dispositive, consideration in assessing the scientific validity of a particular technique or methodology on which an opinion is premised." *Daubert*, 509 U.S. at 594.

⁸⁰ *Daubert v. Merrell Dow Pharms., Inc.*, 43 F.3d 1311 (9th Cir. 1995).

expert testimony was generally accepted, *Daubert* would have required the judge to ask whether the particular expert utilized generally accepted scientific methods. The distinction is elusive. As applied to social science, the implication would be that the court should look to the accepted methodology of the particular social science to determine admissibility. *Daubert*, so interpreted and applied, would result in the same problem of how to define the relevant scientific community as *Frye*.

Since the *Daubert* court clearly overruled *Frye*, this result cannot be correct. Therefore, we are left with two choices in applying *Daubert* to social science testimony. The first choice is to place social science testimony outside the scope of scientific testimony and analyze it as “technical or other scientific testimony.” For reasons articulated in the previous Section, this treatment is misguided and untenable under *Daubert*’s language and policy. The second option is to interpret *Daubert* as providing standards for all “scientific, technical, or specialized knowledge” and apply these standards to social science evidence. The latter is the only tenable position; the difficulty is in determining how *Daubert* defines “science.” The opinion spells out four factors but does not state how these factors are to be aggregated. Therefore, as shown in the discussion of the case law in Section Two, courts have picked and chosen the list, perhaps to reach a particular result, or possibly to derive operational principles from *Daubert*. The final result is that in making the threshold determination of admissibility, some courts look to credentials, others look to publication and peer review, and still others look for a valid scientific methodology which can sometimes be poorly defined.

Although only one court has expressly held that *Daubert* applies to social science, a synthesis of judicial opinion as to how *Daubert* applies is remote and elusive.

Preliminary guidance can be found from some amici in the *Daubert* case, amici not cited in the opinion. The amicus brief of the Carnegie Commission on Science, Technology, and Government (signed by, among others, economist and Nobel laureate Robert Solow) urged rejection of the Ninth Circuit’s over reliance on publication and the *Frye* test in general.⁸¹ The Commission’s proposed test involved an inquiry into three questions combined with a threshold inquiry into competence of the expert based on qualifications and relevance of the testimony. The three proposed questions are: (1) is the claim being put forth testable?; (2) has the claim been empirically tested?; and (3) has the testing been carried out according to scientific methodology?⁸² If the answer to any of these questions is no, then the Commission concludes that the expert opinion must be rejected. As the Commission succinctly stated in its Brief, “[o]pinions based

⁸¹ Brief for Amicus Curiae by Carnegie Commission on Science, Technology, and Government Submitted in Support of Neither Party, *Daubert v. Merrell Dow Pharms., Inc.*, 509 U.S. 579 (1993) (No. 92-102).

⁸² *Id.*

on claims that are not capable of being tested should not be admitted into evidence. Claims that are supported by data that cannot be replicated should likewise be rejected.”⁸³

The Carnegie Commission’s proposal is the same as the first part of *Daubert*’s four factors. The emphasis is on falsifiability and actual falsification. By contrast, the amicus of Physicians, Scientists, and Historians of Science proffered a very different set of guidelines for assessing scientific validity.⁸⁴ The Historians of Science, like the Carnegie Commission, rejected the *Frye* test for very similar reasons. As characterized by the Historians of Science, *Frye* “assumes that science always progresses by the continuous accumulation of objective, irrefutable truths, which are gradually incorporated into consensus reflected in the scientific literature” and that “scientific truths once discovered are complete, universal, immutable, and eternal.”⁸⁵ The language is identical to the Carnegie Commission’s assertion that *Frye* “assumes much more definiteness in science than actually exists, and that this precision takes the form of widely held beliefs about reality that can be readily found.”⁸⁶ The Historians of Science, however, do not suggest rule-based inquiry such as the one proffered by the Carnegie Commission. Instead, the amici offer a series of admonishments over the application of *Frye* to exclude novel claims that may be scientific even if not generally accepted. If the Historians of Science offer any guidance to judges and lawyers, it is that admissibility decisions should not be rigidly based on a formulaic notion of general acceptability. Rather, admissibility decisions should be based on the quality of testimony where “[t]he quality of scientific approach or opinion depends on the strength of its factual premises and on the depth and consistency of its reasoning, not on its appearance in a particular journal or on its popularity among scientists.”⁸⁷ If the Carnegie Commission’s proposal is developed around principles of falsifiability, then the Historians of Science ask the court to look to the factual premises and consistency of reasoning underlying the expert’s testimony.

Are these two approaches different? In a qualitative sense, no; both are

⁸³ *Id.*

⁸⁴ Brief of Amicus Curiae by Physicians, Scientists, and Historians of Science Submitted in Support of Petitioners, *Daubert v. Merrell Dow Pharms., Inc.*, 509 U.S. 579 (1993) (No. 92-102).

⁸⁵ *Id.*

⁸⁶ *Id.*

⁸⁷ *Id.*

empirical in outlook, both focus on the method underlying the opinion rather than the substance of the opinion. However, as applied to social science, the approaches have very distinct implications. The Carnegie Commission's proposal requires that the expert testimony be subject to testability. The classic problem (or critique, depending upon one's perspective) of much social science, and especially economic research, is that it cannot be falsified. For example, the economic assumption that consumers are rational utility maximizers or that firms are profit maximizers is clearly false. Any theory based on such assumptions would logically be false also. If an economic expert were to testify on the negative market effects of price fixing or the benefits of competition in a particular industry, the expert would almost surely be excluded under the Carnegie Commission's test.

This result would be desirable from the more basic question of relevance. If the expert's testimony was too general with regards to either anti-competitive or pro-competitive effects, the testimony would be of questionable relevance as applied to the details of, for example, the health care industry. The Carnegie Commission's test would shift economic experts from those who are purely theoretical to those who have experience with the industry. However, the pivotal question then becomes: of what experience would be sufficient for exclusion? Suppose the expert has studied the health care industry statistically; that is, he has never spoken to actual participants in the industry nor worked in the industry, but has spent a career studying statistics pertinent to the industry. Such an expert would be competent; his testimony would be relevant. However, would it survive a *Daubert* inquiry, at least as proposed by the Carnegie Commission? The answer should hinge on how the expert analyzed the data, the assumptions of his statistical model, and the statistical techniques used to develop and analyze the model. The Carnegie Commission would have the trial judge focus on falsifiability. If the expert's statistical model was built on assumptions that were not falsifiable, then the entire testimony must be excluded. The falsifiability test is arguably too narrow as applied to social science testimony for the simple reason that social scientists cannot conduct natural experiments and instead must always filter empirical data through a theoretical lens that will often contain hidden assumptions that are untestable.

Because of the problem with the falsification criterion, the amicus of the Historians of Science contain a better approach. To the extent that they developed a test, it would consist of two parts: an inquiry into the factual premises and into the consistency of the expert's reasoning. There is no requirement that the testimony be tested or even testable. Instead, there must be an empirical basis and a structural bases for the testimony, foundations in fact and in logic. The inability to test for failure to construct pure natural experiments, unadulterated by theoretical assumptions, would not hinder the admissibility of social science testimony. The problem is whether there is any basis in law to apply this approach to gauge admissibility. The *Daubert* court arguably did not adopt it; the opinion is more consistent with the Carnegie

Commission's proposal even though the court clearly did not make falsification a necessary or sufficient condition for admissibility. Although the court in its third enumerated factor did discuss known error rates and technical flaws, this factor is distinct from consistency of the expert's testimony and from factual basis. Furthermore, the spirit of the *Daubert* opinion suggests a more structured and rigorous analysis of scientific method than that proposed in the Historians of Science amicus. *Daubert* arguably requires more than simply factual basis and logical consistency for admissibility.

More importantly, adopting the more flexible standard would, according to some, vitiate any tendency *Daubert* has to limit junk science in the courtroom. To see this argument, consider how the testimony of a social psychologist's testimony would depend upon whether there was a factual and logical foundation for the testimony. If the psychologist's conclusions pertaining to battered woman's syndrome derived from studies of actual battered women and their responses to a history of abuse, there would be a factual basis for the testimony. If the expert's conclusion that a history of abuse leads to a phenomenon of learned helplessness, then there would be a logical consistency to the testimony presuming that such consistency was established through legitimate psychological principles. The more flexible approach would admit the expert. The *Daubert* four factor approach would arguably exclude the expert. Since battered woman's syndrome has been tested with minimal corroboration in the scientific community and because the error rates for the connection between abuse and helplessness are high, testimony on battered woman's syndrome should be excluded under *Daubert*.⁸⁸ The result seemingly is that the *Daubert* approach is a better filter for the exclusion of junk science.

All of these arguments are ungrounded. The more flexible approach proffered in the amicus of Historians of Science is completely inconsistent with the *Daubert* opinion, even though this amicus was not cited. The *Daubert* court's last factor, "general acceptance," mandates that the judge look to the relevant scientific community for standards to define scientific validity when falsification, peer review, and error rates are not helpful factors.⁸⁹ As argued above, because of the problem of falsificationism in social science, the first three *Daubert* factors are not helpful in determining the admissibility of social science testimony. Therefore, the judge should consider the practices and methodological guidelines of the relevant social science community to develop standards for admissibility. Furthermore, even if the *Daubert* court had not expressly stated general acceptance as one of the factors to consider, the Court did

⁸⁸ See David L. Faigman and Amy J. Wright, *The Battered Woman Syndrome in the Age of Science*, 39 ARIZ. L. REV. 67 (1997). See also Faigman, *supra* note 14.

⁸⁹ *Daubert*, 509 U.S. at 597.

adopt a general acceptance standard for the determination of valid scientific methodology. Therefore, it would not be inconsistent with *Daubert* to consider the approach of the Historians of Science in determining appropriate scientific methodology for the purposes of admissibility.

More troubling may be the assertion that the more flexible approach of looking to factual and logical foundations would result in the increase of junk science in the courtroom. It is not clear that the *Daubert* opinion is refined enough to exclude junk science. The Court itself betrayed confusion over the admissibility of testimony on phases of the moon affecting human behavior. The Court stated that such testimony would not be admissible under Rule 702, “absent creditable grounds supporting” a connection between the two.⁹⁰ The Court was probably simply making the point that there could never be creditable grounds for such testimony. However, the use of the hypothetical leaves open the question whether *Daubert* would permit such testimony to be admitted. Such testimony would almost definitely be excluded under the more flexible approach of requiring both a factual and a logical foundation for the testimony.

Although an expert could in theory establish a factual foundation for the testimony by pointing to such statistical evidence (if it were to exist), that erratic and inexplicable behavior is correlated with the phases of the moon, it would be difficult to establish a logical foundation for such a claim for precisely the reasons raised in my prior discussion. If “moon madness syndrome” exists, how can anyone including the observer of such a syndrome escape its effects? Even if the observer is immune to “moon madness syndrome,” how can we be certain about the definition of madness to be applied in diagnosing this syndrome since a correlation between phases of the moon and irrational behavior suggests a logical, rational relationship to begin with? The more flexible approach dispenses with the phases of the moon expert in a way that the *Daubert* court and the *Daubert* four factor approach cannot.

As for more realistic experts, such as the social psychologist, the requirements of factual and logical foundation is more apt to exclude battered woman’s syndrome, should one advocate such a result. Testimony on battered woman’s syndrome can be excluded either by questioning the factual foundation for the syndrome or by attacking the logical foundation. In determining logical foundation, attention can and should be paid to scientific methodology. The consistency of an expert’s testimony will almost inevitably have to be determined by reference to scientific practice and standards. The more flexible standard, as articulated in the amicus of the Historians of Science, would be less tolerant of junk science than the *Daubert* standard.

Even though the *Daubert* court did not cite the amicus of the Historians of Science, the Court did in effect adopt its more flexible standard. The *Daubert* four

⁹⁰ *Id.* at 592.

factor inquiry is essentially a test of factual foundation (as gauged by peer review and error rates) and logical foundation (as gauged by falsificationism and general acceptance). The problem is that in applying the factors to social science testimony, many courts and commentators have ignored the natural science roots of *Daubert* and the practical problems of applying a natural science standard to the social sciences. As a result, commentators have been draconian on the question of admissibility of social science testimony and courts have been confused and inconsistent in their treatment of social scientists and economists in the courtroom. The requirements of factual and logical foundations are consistent with extending *Daubert* to social science testimony which almost always cannot strictly be falsified.

Further support for the flexible approach is provided by a recent shift in the standards for approving grants for biomedical research, as recently announced by Dr. Harold Varmus, the Director of the National Institute of Health ("NIH").⁹¹ The new standards were a response to Dr. Keith Yamamoto, a researcher at the University of California, San Francisco, and a chair of the advisory panel for the NIH's Division of Research Grants, who criticized the NIH grant reviewers for being too cautious in funding research (largely as a response to tightened budgets) that were too novel. According to Dr. Yamamoto, grant reviewers have been favoring "grants with the best pedigrees rather than those taking on the biggest challenges."⁹² Dr. Varmus's proposed criteria include the following five factors: (1) significance: does this address an important problem?; (2) approach: are the conceptual framework, design, methods, and analyses adequately developed, well integrated, and appropriate to the aims of the project?; (3) innovation: does the project employ novel concepts, approaches or methods?; (4) investigator: is the investigator appropriately trained and well suited to carry out this work?; and (5) environment: does the scientific environment in which the work will be done contribute to the probability of success?⁹³ The purpose of these guidelines is to force reviewers to consider innovativeness as one criterion to limit and overly cautious review process.

The shift in the NIH guidelines casts light on the *Daubert* decision by illustrating how accepted scientific methodology is shaped and can be transformed as a response to budgets and changes in values as well as the needs of a particular field of inquiry. Arguably, courts applying *Daubert* and the *Daubert* court itself have been overly cautious in defining science. Less charitably, courts have not been well attuned

⁹¹ *Review Panels Under Review*, Science 889 (May 9, 1997), obtained on-line at <http://www.sciencemag.org/cgi/content/ful ... text: yamamoto+abd+nih!>.

⁹² *Id.*

⁹³ *Id.*

to the realities of knowledge production by people trained in a natural science or social science background.

III.C. Applications to Remedies

Damages in tort and contract cases is a prominent area in which economics expert testimony has played a critical role.⁹⁴ In contrast to the role of economics experts in antitrust, the field of remedies is not formed purely by economics principles. Common law principles and legislative goals more than economic theory drive theories of remedies.⁹⁵ Yet in many areas, especially in the determination of future profits or earnings, economic theory and methods determine the amount of damages to be awarded. Economists have played an especially important role in the calculation of hedonic damages, the subject of Section III.C.3. This Section considers the role that economics testimony has played in compensation for lost future profits and earnings in tort cases and breach of contract cases. The *Daubert* test has been used by many courts to sharpen emerging common law doctrinal changes to damages. Furthermore, courts have been more consistent in applying *Daubert* as a test for scientific validity in the area of damages as opposed to repackaging the *Frye* test as is observed in the antitrust cases. Because of the treatment of *Daubert*, the cases involving future profits and earnings more clearly allow this author to explore how courts have treated economics qua science.

Many remedies involve loss of future benefits that are inherently incapable of being known. Contract breach is compensated by the award of expectation damages designed to place the party in a position he would have been in if the contract had been performed. What this position consists of is uncertain in many cases and is limited by the common law doctrines of foreseeability and non-speculativeness. Similarly in tort cases, compensation is often awarded for loss of earnings in an attempt to make the victim whole in an economic and financial sense. Once again uncertainty can serve as a bar to recovery. The combination can at least provide a basis for arguing in favor of or against some specific level of damages. Because of the strong role that statistical and

⁹⁴ See, e.g., Ireland *et al.*, *infra* note 135; Johnson & Ireland, *infra* note 135; Reuben E. Slesinger, *The Demise of Hedonic Damage Claims in Tort Litigation*, 6 J. LEG. ECON. 17 (1996).

⁹⁵ For a thorough discussion of the interaction of forensic economics and common law remedies, see Roger I. Abrams, Donald Welsch, & Bruce Jonas, *Stillborn Enterprises: Calculating Expectation Damages Using Forensic Economics*, 57 OHIO ST. L. J. 809, 810-2 (1996).

economic testimony plays in the damage area, it is inevitable that courts have been led to consider the implications of *Daubert* for such testimony. The relevant cases divide into those concerning loss in profits and those concerning loss in earnings. The standards in these two cases overlap, but the distinctions highlight the Court's attitude toward science.

III.C.1. Future Lost Profits in Intellectual Property and Contract

In general, courts have disallowed recovery for future lost profits in breach of contract cases. The rationale is that such damages are too speculative to be recoverable. In the 1970's, several courts diverged from this common law principle upon a showing that there was a reasonable basis on which to base the determination of future lost profits with reasonable certainty. Often the basis for the determination was a statistical study or testimony by individuals within the industry who could attest to the profitability of a particular enterprise or business.⁹⁶ Such testimony was not subject to Rule 702 analysis, or the equivalent under state law. Instead, the standard for admissibility was one of relevance and probity balanced against possible prejudicial effects. After the *Daubert* decision, the four prong test for scientific validity has served as a more rigorous basis for admitting such testimony, particularly with respect to expert economists and financial analysts who have played a greater role in testifying about future profitability.

Typical of the pre-*Daubert* cases is *Singer* where a United States district court of New York admitted a study projecting future profits undertaken at the time the contract was entered into.⁹⁷ The contract was a patent license and the study, prepared by the licensor, demonstrated to the licensee the potential benefits of the patents and expected profits from the use intended by the licensee. Upon breach by the licensor, the issue arose as to how to measure the future profits from the patent with enough certainty to circumvent the problem of speculativeness. The study which was prepared by the licensor filled the gap and was introduced as evidence by the licensee for damages. The result should not be too surprising or disturbing. After all, the study would be a good indicator for the licensee's expectations upon entering into the license, and while not conclusive, is clearly relevant to the amount of future profits. In *Harsha v. State Savings Bank*, the Iowa court resolved the uncertainty by admitting the

⁹⁶ See *Abrams et al.*, *supra* note 94, at 812-8 (discussing the New Business Rule and common law deviations).

⁹⁷ *Perma Research & Dev. Co. v. Singer*, 402 F. Supp. 881 (S.D.N.Y. 1975), *aff'd*, 542 F.2d 111 (2d Cir.), *cert. denied*, 429 U.S. 987 (1976).

testimony of a businessman already in an established and similar business.⁹⁸ In *Lee v. Joseph Seagram & Sons, Inc.*, the Second Circuit allowed the testimony of a certified public accountant whose testimony was comprehensive and involved a reasonable study of the financial status and profitability of a business.⁹⁹ By way of contrast, in *Kenford Co. v. County of Erie*, a New York state court disallowed the expert's projections of future profits from a proposed stadium, the contract for which was reneged by the state.¹⁰⁰ Since there were no similar stadiums and there was no basis for the projections, the damages were held to be too speculative to be recoverable.¹⁰¹

The pre-*Daubert* standard, as it existed in the scattered cases that diverged from the common law rule pertaining to future lost profits, is a highly fact specific inquiry that looked at the type of business and type of testimony. As the contrast between *Singer* and *Kenford* cases indicate, the admissibility of a projection would rest on when the projection took place. However, studies undertaken prior to and at the time of contract formation would be of more relevance than studies done after breach or in anticipating of litigation. Analogy was the most important factor to consider: was the projection based on analogous business enterprises or analogous business situations? If so, then the projection would have been a reasonable basis and provide the requisite degree of certainty to be admissible.

The case of *Bennett Enterprises Inc. v. Domino's Pizza* marks a transition point between the pre-*Daubert* and post-*Daubert* cases.¹⁰² Decided a few months after the *Daubert* decision, the court applied a straightforward reasonable basis test to admit the testimony of a business person within the industry who testified on the amount of future lost profits from a promised franchise from Domino's. The court found that the expert "based his opinions on appropriate financial and business data" and "analyzed the profitability of the store, the sales data, the probable tax repayment schedule, the likelihood of franchise renewal, and other information before calculating his estimate of the lost profits."¹⁰³ More importantly, the court reasoned that the defendant had the opportunity to cross-examine and introduce contrary evidence. The court also cited the

⁹⁸ 346 N.W.2d 791 (Iowa 1984).

⁹⁹ 552 F.2d 447 (2d Cir. 1977).

¹⁰⁰ 489 N.Y.S.3d 939 (N.Y. App. Div. 1985).

¹⁰¹ *Id.*

¹⁰² 1993 U.S. Dist. LEXIS 18576 (D.C. Sept. 3, 1993).

¹⁰³ *Id.* at *6.

then recently decided *Daubert* case for its dicta that the trial court should not be “overly pessimistic about the capabilities of the jury.”¹⁰⁴ The *Bennett* court evinced a liberal attitude towards the admissibility of testimony pertaining to future lost profits, an attitude seemingly unaffected by the *Daubert* standards.

The influence of *Daubert* in the future lost profits area is demonstrated by the *Parkway Garage Inc. v. Cit of Philadelphia* and *Newport* cases.¹⁰⁵ In *Parkway*, a United States district court in Pennsylvania admitted the testimony of an economics expert pertaining to lost profits of a parking garage whose lease with the city for the parking facilities had been canceled. The court, citing *Daubert*, held that

“A trial judge must ensure that any and all scientific testimony or evidence admitted is not only relevant, but reliable.” In that regard, “the word ‘knowledge’ connotes more than subjective belief or unsupported speculation.” While an expert is permitted wide latitude to offer opinion, including those that are not based on first-hand knowledge or observation, it is assumed that an expert’s opinion will have a reliable basis in the knowledge and experience of his discipline.” [citations to *Daubert* omitted]¹⁰⁶

In many ways this standard articulates the reasonable certainty and basis standards identified in the pre-*Daubert* cases. Here, however, the reasonable basis must be grounded in the discipline from which the expert is testifying. In *Parkway*, the court permitted the expert to testify about the financial records of the parking garage. However, any testimony about lost customers and their parking habits was excluded because it would be too speculative and without a basis in the expert’s discipline of economics. Presumably, if the expert had been better versed in the parking industry then such testimony would be admissible. As with *Frye*, identifying the relevant discipline may be a key threshold factor in admissibility.

The *Newport* case involved damages for breach of a real estate contract.¹⁰⁷

¹⁰⁴ *Id.*

¹⁰⁵ 1994 U.S. Dist. LEXIS 10900 (E.D. Pa. 1994).

¹⁰⁶ *Id.* at *29.

¹⁰⁷ *Newport v. Sears, Roebuck & Co.*, 1995 U.S. Dist. LEXIS 7652 (E.D. La. Oct. 24, 1995).

The plaintiff seller wished to introduce the testimony of an expert economist on the issue of real estate absorption rate of the particular industrial park property that was the subject of the contract. The court held a *Daubert* hearing to decide the defendant's motion *in limine* to exclude the testimony. Applying the four prong test, the court held that the expert's multiple regression methodology to project real estate absorption and lost profits had scientific validity under *Daubert* since the method was subject to test and peer review, had standards to control for error rates, and was generally accepted not only by economists but also by the Reference Manual of the Federal Judicial Center ("Reference Manual"). The court cautioned, however, that the admissibility would be subject to Rules 703 and 705, which permit the trial court judge to exclude expert testimony if it is based on data that is unreliable, erroneous, or ephemeral. The court concluded that it "will not allow this expert testimony if the evidence demonstrates that the assumptions used to determine the real estate absorption rate of this property were indeed those of a 'mythical industrial park.'"¹⁰⁸ In other words, the regression analysis should contain factors that pertain to the value of the specific property at issue.

The future applications of *Daubert* in the context of recovery for future lost profits are not completely clear. Courts very likely will apply the *Daubert* factors to determine the scientific validity of the testimony. The *Daubert* inquiry will focus primarily on the reliability of the methods used by the expert and the empirical basis for the testimony. In order to avoid the claim of speculativeness, the expert testimony must relate to the specific business or enterprise at issue. In many ways, the post-*Daubert* cases articulate the reasonable certainty and reasonable basis standards of the pre-*Daubert* cases. However, the key difference is the need for the expert to use methods that have a basis in her proffered field of expertise.

Nonetheless, courts can go in several directions in assessing the admissibility of financial and accounting experts under *Daubert*. In *Hawthorne Partners v. AT&T Tech.*, the court admitted the testimony of a real estate appraiser in a breach of real estate contract case despite a *Daubert* challenge.¹⁰⁹ The court held that real estate appraisal is not a science and therefore not subject to *Daubert*. Instead, the court looked to see if the testimony would be helpful to the trier of fact.¹¹⁰ By contrast, several courts have excluded the testimony of accountants who were testifying in the context of securities fraud or valuation cases. In *Sanchez v. KPMG Peat Marwick*¹¹¹ and *Biben*

¹⁰⁸ *Id.* at *3.

¹⁰⁹ 1993 U.S. Dist. LEXIS 11118 (N.D. Ill. Aug. 11, 1993).

¹¹⁰ See discussion *supra* Section II.

¹¹¹ 1996 U.S. Dist. LEXIS 2773 (N.M. Jan. 5, 1996).

v. Card,¹¹² the courts excluded the expert accountants on the grounds that their testimony was too conclusory as to the ultimate question of law; oddly the courts cited *Daubert* as the basis for their exclusion.¹¹³ In *Brinati v. KPMG Peat Marwick*, the court excluded the testimony of an accountant on the issue of valuation because his use of the discounted cash flow method made some unacceptable assumptions of the value of raw land and partially completed construction projects.¹¹⁴ The standards to be applied under *Daubert* and the manner in which they are to be applied are far from certain as these few cases indicate.

III.C.2. Future Lost Earnings in Torts and Lost Value in Property

Recovery for future earnings suffers from the same defect as recovery for future lost profits: the problem of speculativeness and uncertainty. The uncertainty is less in the future lost earnings context because of the availability of more precise and reliable reference groups. After all, if an individual air pilot is killed, her future earnings would arguably be the same as those of another air pilot similarly situated with the same age and experience. By contrast, profits lost from breach of a patent license are less certain precisely because each invention is unique and non-obvious. Ironically, human beings in their status as workers are fungible in a way that business enterprises are not.

However, uncertainty is introduced in terms of alternative career paths foreclosed to the victim and the effects of a disability resulting from the accident on future earnings. In *Joy*, a case that illustrates both the pre-*Daubert* and post-*Daubert* standards, the United States Court of Appeals for the District of Columbia overturned the district court's admission of expert economics testimony pertaining to lost earnings from a field that the deceased may have entered in the future.¹¹⁵ Objectivity and lack

¹¹² 1994 U.S. Dist. LEXIS 18132 (W.D. Mo. Mar. 2, 1994).

¹¹³ The cases involved professional malpractice for accountants, and at issue was the ability of the expert accountant to testify to the ultimate issue of negligence based on the accounting practices of the defendant firms. The discussions of *Daubert* are quite superficial; one court stated that under *Daubert*, an expert's opinion that "is not based on sound methodology or that results from mere surmise or conjecture" should be excluded." Sanchez, 1996 U.S. Dist. LEXIS at *8.

¹¹⁴ 2 F.3d 183 (7th Cir. 1992).

¹¹⁵ 999 F.2d at 549.

of speculation are the key regulating factors.

The *Daubert* standard was first applied to testimony pertaining to future lost earnings in *Yeuh-Lan Liu v. Korean Air Lines Co.*, a case arising from the Korean Air Lines disaster of 1983.¹¹⁶ The court in a *Daubert* hearing permitted the expert economist to testify to general economic conditions of Taiwan, where the plaintiff was employed, and to general growth and inflationary factors useful for projection. However, the expert could not testify about lost fringe benefits or lost promotion opportunities because the testimony would be too speculative. In applying *Daubert*, the court did not apply the four-prong test, but based its inquiry on whether the testimony was scientific and whether it would assist the trier of fact. In undertaking this inquiry, the court essentially looked to see if the testimony was too speculative and without a reliable empirical basis.

The application of the *Daubert* standard rests on the level of generality of the expert's study. The more removed the expert's data is from the facts of the particular case the more unreliable and speculative his testimony becomes. For example, in both *Marcel v. See, Inc.*,¹¹⁷ and *Henry v. Hess Oil Virgin Islands Corp.*,¹¹⁸ the court excluded the expert's testimony because the projections of future earnings were based on general industry studies that failed to take into consideration the specific circumstances of the plaintiff. In *Rowe v. State Farm Mut. Auto. Ins. Co.*, by contrast, the court allowed the projections because they were based on the past billing history of the plaintiff, who as a result of his injuries could not longer practice law.¹¹⁹ In *Bowman v. International Petroleum Corp.*, the court appears the most deferential to the expert, allowing his testimony on future lost earnings because "other experts in the field similarly rely on the same evidence."¹²⁰

Post-*Daubert*, trial courts still apply a reliability and helpfulness standard in gauging the admissibility of expert testimony on future lost earnings. The key difference that *Daubert* seems to have had in this area is for some courts to allow the expert to testify as long as his methods are accepted within the community. The status of the expert's field as science seems largely irrelevant to the inquiry. Instead, the focus post-*Daubert* is on speculativeness, a standard already established in the pre-

¹¹⁶ 1993 U.S. Dist. LEXIS 16233, at *3 (S.D.N.Y. Nov. 16, 1993).

¹¹⁷ 11 F.3d 563 (5th Cir. 1994).

¹¹⁸ 163 F.R.D. 237 (V.I. 1995).

¹¹⁹ 670 So. 2d 718 (La. 1996).

¹²⁰ 1995 U.S. Dist. LEXIS 10873 at *4 (E.D. Pa. 1995).

Daubert common law of damages. Courts in ruling on the admissibility of expert economics testimony pertaining to future lost profits and earnings have for the most part adopted the standard of reasonable basis and speculativeness under *Daubert*, a standard developed in pre-*Daubert* cases. While pre-*Daubert*, courts would look to the foundation for the testimony to determine reasonable basis, post-*Daubert* a few courts have looked to scientific methodology to determine whether the testimony was pure speculation or had a reasonable basis in fact. The distinction between the two regimes is in part the difference between the beekeeper and the aeronautical engineer. Pre-*Daubert*, courts would look to see if the expert was familiar with the particular industry about which he was testifying. For example, if the lost profits or earnings were in the sports industry, the expert would have to know something about the particular industry to have his testimony admitted. Post-*Daubert*, the courts have a somewhat broader scope. Experts are admissible if their techniques and methods would be scientifically valid. For example, in *Newport*, the court admitted the expert's econometrics study of real estate absorption because the statistical methodology was valid, even if the expert did not have great familiarity with the real estate industry. By contrast, in *Parkway*, courts allowed the economic expert to testify only on financial records of the parking garage, not on consumer demand for parking services because the latter testimony would be too speculative. The key effect of the *Daubert* decision in the area of lost earnings and profits is the introduction of scientific methodology as a factor for the determination of reasonableness.

The courts in applying *Daubert* to testimony pertaining to lost earnings and profits have been more consistent and coherent than courts reviewing antitrust testimony. There has been very little, if any, deference given to credentials. Instead, the *Daubert* mandate has been followed; courts have looked to methodological validity and to the general scientific community for information about such validity. Since most of the testimony is statistical, courts have reviewed the statistical methodology of the expert to ensure reliability. The Reference Manual has been a useful and valuable source to determine factors for validity. In addition, courts have made an attempt to appreciate the statistical nature of the inquiry. An expert need not be familiar with the particular industry or market to analyze the statistical data associated with the industry or market to analyze the statistical data associated with the industry or market and make inferences from such data. Accepting the *Berry* distinction between beekeepers and aeronautical engineers, some courts have been admitting the equivalent of aeronautical engineers to testify about future earnings and profits rather than beekeepers who have been observing the industry or market through direct participation.

The only flaw in the post-*Daubert* cases is the lack of sensitivity to the filter through which experts filter their experiences. The *Parkway* court failed to realize that the expert was qualified to testify about customers and parking habits in addition to the financials. Economists look at financial data of course, but they also look at consumption data pertaining to food, clothing, housing, and most importantly for the

Parkway case, transportation. Therefore, lack of familiarity with the parking industry should not have been a bar to admitting the testimony. If the data were available and reliable (an inquiry under Rule 703, rather than Rule 702), then the expert should have been permitted to testify about his statistical analysis of the data. The *Parkway* court was seeking a beekeeper when an aeronautical engineer would do. In other terms, the court was adequately defining the filter through which the expert was testifying.

The pre-*Daubert* standard of reasonableness is arguably the post-*Daubert* standard in ruling on the admissibility of expert testimony pertaining to future lost profits and earnings. What courts find “reasonable” is now informed by the call for valid scientific methodology. As the discussion of the case law indicates, courts have made some attempt to define the valid scientific methodology. However, courts, as in the antitrust cases, have failed to appreciate the meaning and use of statistical and economic models and their usefulness in analyzing data. Statistical methods can provide a reasonable basis for determining damages even if the statistician is not grounded in the specific industry or market under study. Of course such experts would be desirable for testimony on particular industry or market conditions, but they are not necessarily superior to, nor a substitute for, a statistician or econometrician applying valid methods to reliable data. Courts in this area should not conflate the two types of experts.

III.C.3. Hedonic Damages

Hedonic damages are compensation for loss of value of life independent of the market, productive value of the individual.¹²¹ They are an attempt to measure the value of the pleasure of being alive which supplements other compensatory economic losses.

Suppose an automobile accident results in the death of two individuals, each the same age and educational characteristics, one a successful electrician, the other a struggling artist. If a purely market based measure of damages were used, each would receive the value of lost market wages resulting in the artist’s estate receiving almost nothing. Hedonic damages are designed to compensate each victim for the loss of life itself, a value that would not necessarily be captured in the market based losses.

The difficulty arises in measuring the value of life that any one individual has lost. Relying on the testimony of the surviving heirs would undoubtedly overestimate the value of the victim’s life as the heirs would assuredly testify to how much the victim

¹²¹ See Joseph A. Kuiper, *The Courts, Daubert, and Willingness to Pay: The Doubtful Future of Hedonic Damages Testimony Under the Federal Rules of Evidence*, 1996 ILL. L. REV. 1197, 1204-06 (1996).

enjoyed the various pleasures of life. Even if such testimony were considered, the obvious problem of placing a dollar value on the pleasure from activities such as a walk in the park, scuba diving, painting, writing, reading, etc., is seemingly insurmountable. Economists overcome some of these difficulties by undertaking willingness to pay studies.¹²² Actual market choices provide a basis for economists to construct measures of how much consumers are willing to pay for such life saving benefits as seatbelts, airbags, and other life saving devices. By comparing the dollars spent with the accompanying reduction in probability of death and increase in life expectancy, economists can place a dollar value on how much individuals are willing to spend on increased life expectancy.¹²³ Other empirical bases for determining the value of life include studies of “compensating wage differentials,” which compare how much more certain high risk occupations pay in comparison with the resulting reduction in life expectancy.¹²⁴ Studies that look at consumer choices of life saving devices measures an average consumer’s willingness to pay for additional life expectancy. Studies that look at compensating wage differentials measure an average consumer’s willingness to accept for loss in life expectancy.

Prior to *Daubert*, there was a split among courts’ willingness to admit expert economic testimony on hedonic damages. The split is best exemplified within the Seventh Circuit in the mid-Eighties and early Nineties. In *Sherrod v. City of Joliet*, a 1985 case involving damages in a Section 1983 action brought against an Illinois police officer accused of shooting an African-American, a United States district court permitted testimony on hedonic damages by Stan Smith, an economist with a Master’s degree from the University of Chicago, whose name appears with frequency in litigation over hedonic damages.¹²⁵ The court’s reasoning however is unclear as indicated by the following excerpt:

¹²² See Kuiper, *supra* note 120, at 1206-13; see also W. Kip Viscusi, *Fatal Tradeoffs: Public & Private Responsibilities for Risk* 34-74 (1992) (discussing the various economic techniques used to measure value of life from labor market and consumer studies).

¹²³ See Viscusi, *supra* note 121, at 67-70 (discussing survey evidence on amount actually paid for life saving technology).

¹²⁴ See Viscusi, *supra* note 121, at 34 (stating that “jobs that carry with them certain disadvantages must have other offsetting advantages such as higher wages that make them as attractive overall as jobs without those advantages”).

¹²⁵ 629 F. Supp. 159 (N.D. Ill. 1985).

“Life,” Blackstone has reminded us, “is the immediate gift of God, a right inherent by nature in every individual” The deprivation of life that is prohibited by the Fourteenth Amendment includes “not only life [itself], but of whatever God has given to everyone with life for its growth and enjoyment.” In other words, loss of life means more than being deprived of the right to exist, or of the ability to earn a living; it includes deprivation of the pleasures of life.

This is the point that Smith discussed with the jury when he told them about the hedonic value of life Smith’s expert testimony enabled the jury to consider the important aspect of injury which the estate of Ronald Sherrod suffered All competent evidence tending to establish a legitimate item of damage is, under proper pleadings, relevant and admissible. [internal citations omitted]¹²⁶

There was no discussion of possible prejudicial effects under Rule 403; there was discussion about Smith’s credentials, about the number of corroborative studies, but it is not clear whether the court was looking to general acceptance or some other standard in judging admissibility. The import of the *Sherrod* decision is further confounded by the Seventh Circuit’s reversal and remand of the case on the grounds relating to the substantive Section 1983 claim.¹²⁷ Nonetheless, the district court opinion is sometimes still cited for admitting expert economic evidence on hedonic damages.

An opposite, and arguably more rigorous, approach was adopted by the court in *Mercado v. Ahmed*, a 1991 case involving damages resulting from an automobile accident.¹²⁸ The district court in *Mercado*, after engaging in fairly stimulating discussion of science, law and truth, excluded Mr. Smith’s testimony on hedonic damages because “there is no basic agreement among economists as to what elements ought to go into life valuation. There is no unanimity on which studies ought to be considered. There is a lack of reliability.”¹²⁹ The ruling rested in part on relevance, in part on reliability, and in part on general acceptance. As far as general acceptance, the court’s unanimity standard is obviously burdensome and inconsistent with *Frye* and its

¹²⁶ *Id.* at 163-4.

¹²⁷ *Sherrod*, 856 F.2d at 802.

¹²⁸ 756 F. Supp. 1097 (N.D. Ill. 1991), *aff’d*, 974 F.2d 863 (7th Cir. 1992).

¹²⁹ *Id.* at 1101.

varied applications. After all, *Frye* does not require general acceptance among natural scientists. Why should it when applied to a field whose status as science is doubtful? What perhaps underlay the court's reasoning was a concern that the testimony on loss of life did not require an expert because at its heart measurement of the value of life is not a meaningful scientific inquiry.

What is wrong here is not that the evidence is founded on consensus or agreement, it is that the consensus is that of persons who are no more expert than are the jurors on the value of the lost pleasure of life. Even if reliable and valid, the evidence may fail to assist the trier of fact to understand the evidence or determine a fact in issue in a way more meaningful than would occur if the jury asked a group of wise courtroom bystanders for their opinion.¹³⁰

The general helpfulness standard was cited by the Seventh Circuit in its affirmance of the district court's evidentiary ruling in *Mercado*.

The tension between *Sherrod* and *Mercado* has yet to be resolved. Even *Daubert* cannot resolve the conflict. In *Estate of Sinthasomphone v. City of Milwaukee*, a United States district court in Wisconsin acknowledged the tension between *Sherrod* and *Mercado* in the light of *Daubert*.¹³¹ The court concluded that:

[T]he problem with Mr. Smith's testimony is that he is attempting to quantify something which cannot truly be determined: what is the value of human life? He rests his determination on a number of studies which are themselves grounded in the science of economics which, in the first place, is not quite like physics. Does this mean that his testimony will not assist the jury or will mislead them? I am not, at this point, convinced of that. His testimony may conceivably be useful for the jury to have some starting point in their attempt to place a value on life.¹³²

¹³⁰ *Mercado v. Ahmed*, 974 F.2d 863, 870 (7th Cir. 1992).

¹³¹ 878 F. Supp. 147 (E.D. Wis. 1995).

¹³² *Id.* at 152.

A United States district court in Illinois was more certain about the admissibility of expert testimony on hedonic damages. In *Ayers v. Robinson*, the court held that expert testimony on hedonic damages did not survive the four-pronged *Daubert* standard.¹³³

Even if this Court were to find that the methodology underlying those studies constituted “science” as that term is properly understood, it would still have to exclude them under the helpfulness standard of Rule 702. It would really be no use to a jury to hear that others had placed a value of life greater than \$500 thousand and less than \$9 million. And it is frankly bogus to massage those numbers, as both Hedonic Damages and Plausible Result have done, to create a deceptive appearance of precision rather than the true picture of an enormous spread in “value.”¹³⁴

Several lower courts have rejected the use of experts on hedonic damages applying an analysis similar to that in *Ayers*.¹³⁵ Most of the courts have based their decision on the persuasive authority of *Mercado*; those who have also cited *Daubert* have done so in a cursory manner.

Several economists, especially those working in the area of forensic economics, agree with *Ayers*, Dr. Thomas Ireland being the most prominent.¹³⁶ The criticism rests

¹³³ 887 F. Supp. 1049 (N.D. Ill. 1995).

¹³⁴ *Id.* at 1063.

¹³⁵ The cases that have followed *Ayers/Mercado* include: *Pick v. American Med. Serv., Inc.* 1997 U.S. Dist. LEXIS 3588 (E.D. La. 1997); *Kurncz v. Honda*, 166 F.R.D. 386 (W.D. Mich. 1996); *Anderson v. Nebraska Dept. of Soc. Serv.*, 538 N.W. 732 (Neb. 1995); *Chustz v. J.B. Hunt Trans. Inc.*, 659 So.2d 784 (La. 1995); *Hein v. Merck & Co., Inc.*, 868 F. Supp. 230 (D. Tenn. 1994); *Montalvo v. Lapez*, 884 P.2d 345 (Haw. 1994); *Sullivan v. U.S. Gypsum Co.*, 862 F. Supp. 317 (D. Kan. 1994); *Longman v. Allstate Ins. Co.*, 635 So.2d 343 (La. 1994); *Wilt v. Buracker*, 443 S.E.2d 196 (W. Va. 1993); *Laing v. Honda*, 628 So.2d 196 (La. 1993); *Livingston v. U.S.*, 817 F. Supp. 601 (E.D.N.C. 1993).

¹³⁶ See Dr. Walter D. Johnson & Dr. Thomas R. Ireland, *Qualifications and Admissibility: Applying the Daubert Mandate to Economic Testimony*, (March 26, 1997) (unpublished manuscript on file with the author); Thomas R. Ireland *et al.*, *Economic Science and Hedonic Damages in Light of Daubert v. Merrell Dow*, (February 2, 1997) (unpublished manuscript on file with the author).

on the work of Thomas Schelling who has cautioned against extrapolating from statistical lives to actual lives.¹³⁷ Such an extrapolation would be subject to the error of assuming that choices of individuals who may be heterogeneous in their attitude towards risk can be representative of an average or typical individual. However, this criticism addresses only how numbers are aggregated, not the relevance that individuals are willing to pay for additional risks in their lives. If one of the purposes of tort damages is to compensate, then failure to completely compensate for loss of life by denying hedonic damages or evidence for hedonic damages would undermine one of the chief purposes of making individuals whole through a monetary remedy. Current testimony on hedonic damages errs in aggregating market choices that determine the value of a statistical life and applying this aggregation to actual life. However, information about the value of risks may be relevant to determining the value of an actual life. Therefore, evidence on the value of risks should not be excluded even though as Dr. Ireland and Professor Schelling correctly conclude evidence on the value of statistical lives is irrelevant and should be excluded.

To understand how testimony on hedonic damages can be helpful, it would be useful to compare and contrast how courts have treated hedonic damages with how courts have treated contingent valuation or willingness to pay measures in environmental cases. The most important case on point is *State of Ohio v. Department of Interior*, in which the D.C. Circuit ordered the Department of Interior to consider both use and non-use values in calculating valuation method in measuring non-use values.¹³⁸ Just as measures of hedonic damages attempt to measure the value of being alive, independent of pecuniary earnings, consumption, and other purely “economic” values, non-use values of damages attempt to measure the value placed on the mere existence of environmental amenities. Use value is the value placed on using national parks and the attendant enjoyment from use; non-use value measures the pleasure obtained from the pure existence of the parks independent of any use. Often use values can be measured by market equivalents such as looking to the drop in price of a particular commodity (such as a recreational facility) after a natural or environmental disaster. However, when no market exists for the environmental amenities, economists have looked to surveys to measure the value placed on both the use and non-use of the amenities. This latter method is the contingent valuation method and involves the use of surveys which typically ask how much a particular individual is willing to accept in exchange for the loss of an amenity. Many industry participants and economists were

¹³⁷ Thomas Schelling, *The Value of Life* in THE NEW PALSgrave DICTIONARY OF ECONOMICS (Social Economics) (1990).

¹³⁸ 880 F.2d 432 (D.C. Cir. 1989).

critical of the contingent valuation method because it tended to overstate value.¹³⁹ However, the D.C. Circuit endorsed the method finding it consistent with the Superfund provisions.

The *State of Ohio* case was a pre-*Daubert* opinion. More importantly, it was a case in which the Federal Rules of Evidence would not apply since the Department of Interior, like all agencies, are not limited by the Federal Rules. However, the case raises an interesting contrast to the court's treatment of similar evidence in civil cases. Could contingent valuation methods be used in nuisance cases as evidence of damages? If the reasoning of the hedonic damage cases were held to apply, then the answer would most likely be no. Even if contingent valuation were scientific, it would not necessarily be helpful since a jury does not need an expert to determine the value of resources absent a market. Jurors can form their own sense of the value of recreational areas much in the same way they can form their sense of the value of life. However, there is adequate support for the use of contingent valuation to value natural resources. Although some of the survey methods underlying contingent valuation have been criticized, a panel of economists including several Nobel Laureates concluded that "contingent valuation studies can produce estimates reliable enough to be the starting point of a judicial process of damage assessment, including lost passive-use values."¹⁴⁰ Under a general acceptance standard, contingent valuation studies will very likely be admissible. Under *Daubert*, they should be as well since there is general acceptance for the methodology underlying the studies. However, under the rationale of the hedonic damage cases, they should almost certainly be excluded. The proper treatment of testimony pertaining to hedonic damages and contingent valuation remains uncertain and confusing. Improper attention has been paid to the scientific bases for each testimony.¹⁴¹

It should of course be noted that the court in *State of Ohio* endorsed contingent valuation largely on grounds of statutory interpretation and due process grounds. Hedonic damages have no federal statutory basis. However, the one state that has

¹³⁹ Paul R. Portney, *The Contingent Valuation Debate: Why Economists Should Care*, 8 J. ECON. PERSP. 3, 6-7 (1994).

¹⁴⁰ *Id.* at 8.

¹⁴¹ See discussions in W. Michael Hanemann, *Valuing the Environment Through Contingent Valuation*, 8 J. ECON. PERSP. 19, 32-37 (1994) (advocating narrow use of contingent valuation studies); and Peter A. Diamond & Jerry A. Hausman, *Contingent Valuation: Is Some Number Better than No Number?*, 8 J. ECON. PERSP. 45, 47-58 (1994) (concluding that contingent valuation is deeply flawed from methodological perspective).

permitted testimony on hedonic damages post-*Daubert* has done so statutorily.¹⁴² The different treatment of economic testimony under the Federal Rules of Evidence, common law remedies, and pertinent statutes both federal and state raise difficult questions on how scientific knowledge is used differently in legislative and judicial contexts. The *Daubert* standard applies of course only to the latter and not to the former.

The treatment of testimony on hedonic damages post-*Daubert* is rooted in a pre-*Daubert* reading of Rule 702 and poses a particularly large obstacle to those who need or advocate the use of hedonic damage measures. Courts have ignored the question of scientific validity of hedonic damage measures; instead, they have concluded that even if there were a scientific foundation for the measure, testimony on hedonic damages imply would not be helpful to the trier of fact. Proponents of hedonic damages need to establish not only that there is a scientific basis for such measures, but also that such measure would be helpful to the jury.

Surmounting these two hurdles is not a simple task. Court opinions betray a view that hedonic damage experts are the epitome of junk scientists. However, courts should consider what jurors may consider without the use of an expert. Of course, no one is an expert on the value of life. The question of value of life is obviously a philosophical, moral, and religious one in addition to (or perhaps instead of) being economic and statistical. However, in dismissing testimony on hedonic damages on this ground, the courts make a mistake analogous to the economist's confusion of value with price. For legal purposes, for the purposes of measuring compensatory damages, the value of life is the price of life. Once the decision has been made to compensate for loss of life (a decision that can be either legislative or judicial), the decision-maker has already reduced value to price. The decision maker would not have standing, having done so, to take the high moral ground and state that value is not price. Any decision to limit hedonic damages should not, and cannot, be based on the helpfulness of economists in measuring price, unless the economist's method was without scientific foundation. Once the remedy has been permitted, economic testimony is almost necessarily helpful for its measure.

Absent such testimony, the question becomes one of discerning what basis jurors would look to in determining value of life. Would a poor person's life be valued less than a rich person's? An African-American's less than a Caucasian's? A woman's less than a man's? Research in the area of tort damages has demonstrated such biases, usually supported by lawyer's testimony and in some cases by expert testimony on valuation.¹⁴³ No doubt expert testimony on hedonic damages may also introduce such

¹⁴² See Sena, *supra* note 134.

¹⁴³ Martha Chamallas, *Questioning the Use of Race-Specific and Gender-*

biases. However, reliance on untethered jury discretion in measuring value of life would exacerbate their prevalence. More importantly, such untethered discretion would for the most part be unreviewable. Expert testimony on other hand can be reviewed both at the trial and the appellate levels for prejudicial effects, including effects that would lead to discriminatory results. Although the question of value of life may arguably not be a question suitable for experts, it is incorrect to say that we can all price life equally well or in a consistent and reasonable manner. Expert testimony would provide guidance as to the price of life that is both consistent and logical even if the metaphysical question of value remains forever a mystery.

Expert testimony on hedonic damages for all these reasons is in fact helpful, contra *Mercado* and its progeny. However, the first hurdle still remains: is it scientific under *Daubert*? The answer to the latter question is not to the extent that *Daubert* requires falsifiability. If an economist computes that his measure of the value of life, based on risk analysis, is two million dollars, how can this testimony be falsified or even tested? The court could review the statistical validity of the finding, whether the economist used proper survey method and statistical analysis, but there is something about the conclusion that reeks of non-science. If another economist testified to one million dollars, which one if either is to be believed? Is the inquiry for the court simply one of reviewing statistical method? Or should the court somehow not allow any testimony because of the problem of testing it for validity?

As I have argued throughout this paper, falsifiability is not a requirement that is consistent with the social science method. Social scientists of course want to test the validity of their findings by holding them up to data, but many social science conclusions, like many natural science conclusions, are generalizations made from observations. Even if an observation is obtained contrary to the conclusion, the conclusion can be save through careful and clever rethinking of the background assumptions supporting the conclusion. To put it in more familiar terms, social science is not testable because all relevant variables cannot be controlled for in a systematic manner and even if they could, the underlying model will always have assumptions that can never be tested.

Such is a case with economic studies of the value of the life. Economists can analyze data and determine a number. The number is interpreted within the context of a theory and used as a measure of the price individuals are willing to pay for various risks. This price implicitly measures how much individuals are willing to pay to forsake life itself. The number, the price, cannot be proved or disproved; it is a question

Specific Economic Data in Tort Litigation: A Constituted Argument, 63 FORD. L. REV. 73 (1994) (documenting the award of lower tort damages to women and minorities based on statistical disparities in life expectancy and earnings across gender and race).

of interpretation . . . one that is helpful to the trier of fact and one that is shaped by the logic of the economic enterprise. It is within this enterprise that courts should assess the scientific validity of hedonic damage testimony. The current approach, to rule that hedonic testimony is unhelpful because each individual can assess the value of life, implicitly overrules the right to certain tort damages. Such an overruling should be done expressly rather than through questionable glosses on the meaning of science and scientific.

III.D. Methodology and Expert Knowledge

What is science? The *Daubert* Court presented an answer grounded in the legal method of positivism. The answer ignored the differences in methods used by the various field of knowledge. The problem is that the Court asked the wrong question in *Daubert*. Instead of grappling with the conundrum of what is science, they should have focused on the actual problem raised by Rule 702: what is knowledge? This Section traces the ways in which knowledge is derived in Economics and have highlighted the key terms in the debate. It also demonstrates how this academic debate about method plays out in the courtroom over the question of the admissibility of economic experts. In the next Section, the strands of the academic and legal debate are brought to bear on the questions raised by the *Carmichael* case.

IV. Implications for Carmichael

There is a Russian egg quality to the question of whether an expert witness is testifying about scientific knowledge. In *Daubert*, the Supreme Court laid out a standard that expert witness testimony must pass for scientific validity. In *Carmichael*, the Court will determine whether expert witness testimony is in fact scientific and must be scrutinized under the test for scientific validity. At some level, the analysis is circular: a district court judge must first determine whether testimony first is based in science before she can determine whether the testimony represents valid science. The inquiry should be about the validity of the testimony. The quest for categorizing the testimony as scientific or non-scientific is misleading and inevitably confusing. For this reason alone, the Court is urged in *Carmichael* to adopt a monist standard for interpreting Rule 702.

As a practical matter, the Court will most likely adopt a dualist interpretation. Its reasoning will be that *Daubert* was concerned with the applicability of *Frye* under Rule 702. Since *Frye* dealt ostensibly with scientific testimony, *Daubert* logically must apply only to scientific testimony as well. The Court will offer a separate standard for technical or other specialized knowledge, perhaps one based on a general helpfulness standard as adopted by the dualist circuits, or leave the development of the second standard to the lower courts. This resolution would be the narrowest (and hence most

likely) manner for resolving the question in *Carmichael*.

As should be apparent from this paper, this author would contend that a dualist interpretation of *Daubert* would be mistaken. Reasons have been elaborated above. To summarize the four main reasons why the Court should adopt a monist interpretation:

1. A dualist interpretation is inconsistent with the facts of *Daubert*. If the Court rules that *Daubert* applies only to scientific testimony, the Court will need to explain how epidemiology, the subject of the testimony at issue in *Daubert* is scientific. The testimony in *Frye* pertained to polygraph evidence. The underlying science of measuring changes in body temperature when the subject fails to tell the truth rested on two propositions: (1) that body temperature responds to dishonest statements and (2) that the machine can measure these changes in body temperature. The epidemiological testimony, however, is qualitatively different from the polygraph testimony for three reasons. First, the testimony was based on statistical data and therefore was subject to errors in data collection and model construction. Second, the testimony was based on the interpretation of the expert in both constructing the model, including relevant variables, and analyzing the final statistical results. Third, the testimony was based on interpretation of a causal relationship which may have many causes and alternative explanations. If the Court implicitly is assuming that epidemiology is scientific, then other interpretative disciplines, such as the social sciences, are also scientific.

Furthermore, the Court may have difficulty in distinguishing the knowledge of the tire expert from scientific knowledge since the tire expert is applying scientific principles in making inferences about the cause of an accident from tire skid marks and the patterns on the exploded tire.

The Court can circumvent these problems by adopting one of the more specific versions of the dualist interpretation. A Dualist Type One interpretation would not be consistent with the Court's treatment of epidemiology, a field that no one considers to be a hard science. The Court could reconcile its treatment of epidemiology by adopting a Dualist Type Two interpretation and holding that *Daubert* applies to hard and social sciences but not to applied fields, such as tire experts. The problem with this holding is that it is not consistent with treating the output of machines as scientific. A machine is an application of scientific principles; its output offers an interpretation of data. The testimony of tire expert could be generated with a machine; an engineer could input the relevant data through a computer model and generate a result that would have the same weight as the interpretation of a human expert. Why should there be two different standards when the underlying testimony and mechanism for deriving the testimony are the same? As a last resort, the Court may utilize a Dualist Type Three interpretation, but such an approach would be subject to the same charge of fragmentation and incoherence raised above. Such an interpretation would also suffer from the problems of gamesmanship and inconsistency detailed below.

2. A dualist interpretation would leave open the question of how the trial court is to distinguish scientific from technical or other specialized knowledge. The *Daubert* Court framed the legal issue as one of determining whether proffered testimony is scientifically valid. The answer to this question, rooted in Popper and Hempel, rested on the demarcation problem: how can one distinguish between scientific and non-scientific statements? The *Daubert* factors are legal standards by which to answer the demarcation question. In *Carmichael*, the Court is confronted with the question of whether *Daubert* applies only to scientific knowledge or also to technical and other specialized knowledge. In light of the *Daubert* court's focus on the problem of demarcation, the answer in *Carmichael* arguably will be that the *Daubert* factors apply only to scientific knowledge. However, such a holding will raise the obvious question: what is the standard for distinguishing scientific from technical and other specialized knowledge? The Court needs to design standards to first identify scientific knowledge so that the district court will know whether or not to apply the *Daubert* factors to ascertain valid scientific knowledge.

This circularity can be reconciled in many ways, each racked with problems. The Court can limit *Daubert* to novel, hard scientific testimony. This holding raises the problem of epidemiology, which bears more than a family resemblance to social science. To circumvent this problem, the Court could hold that *Daubert* applies to theoretical, hard, and social science but not to applied fields such as that of the tire expert. The problem with this is that applied fields entail the application of scientific principles and many courts have held that *Daubert* applies to machines since the output of machines involves the application of scientific principles. Furthermore, the epidemiologist resembles in many ways the tire expert. Both utilize the method of deduction to make inferences from data through the use of principles. In many ways, the demarcation problems arise once again. Finally, the Court could hold that different versions of *Daubert* hold for hard and social sciences and for theoretical and applied fields; referred to as *Daubert* Type Three. As suggested before, the problem is one of incoherence and inconsistency.

These problems could be avoided altogether if the Court adopted a monist interpretation and held that the *Daubert* factors applied to all fields of knowledge. As discussed in more detail below, this will avoid the problems of dualism and recognize that the issue of the validity of knowledge pervades all fields. A monist holding would also refocus the debate underlying Rule 702 on the questions of methodology versus conclusions.

3. A dualist interpretation would not be consistent with the text of Rule 702 and of *Daubert*. Rule 702 begins, "If scientific, technical or other specialized knowledge will assist the trier of fact . . ." The *Daubert* Court focused on the meaning of the word "scientific." However, the operative word in Rule 702 is "knowledge."

The adjectives that precede can be read as expanded way of saying “expert.” The purport of Rule 702 is the admissibility of expert knowledge; the goal of *Daubert* is to determine when expert knowledge has the imprimatur of validity in order to be of assistance to the trier of fact. The key distinction is between expert and lay testimony, not between scientific and other expert testimony. Support for this reading is provided by the Legislative Notes which state:

The rule is broadly phrased. The fields of knowledge which may be drawn upon are not limited merely to the “scientific” and “technical” but extend to all “specialized” knowledge. Similarly the expert is viewed, not in a narrow sense, but as a person qualified by “knowledge, skill, experience, training or education.” Thus within the scope of the rule are not experts in the strictest sense of the word, e.g., physicians, physicists, and architects, but also the large group sometimes called “skilled” witnesses, such as banker or landowners testifying to land values.¹⁴⁴

The Note speaks of Rule 702 in an integrated manner as applying to all experts and not in terms of distinctions between scientific and non-scientific experts. Accordingly, the Court should interpret the *Daubert* factors in a monist manner.

The Note also states that expert testimony are excluded when “they are unhelpful and therefore superfluous and a waste of time.”¹⁴⁵ The argument could be made that the *Daubert* factors are helpful in determining when scientific knowledge is helpful and that the *Daubert* court simply left open the standards for helpfulness to be applied to technical or other specialized knowledge. This reading is not consistent with the text of *Daubert*. Although the Court did expressly state that it was not addressing the question of technical or other specialized knowledge, the Court also stated that the third *Daubert* factor was known error rates for any technique used by the expert. The consideration of this factor suggests that at least technical knowledge would be within the scope of knowledge to which *Daubert* applies. Furthermore, the *Daubert* Court’s focus was not simply on scientific validity, but also relevance and materiality concerns that would implicate all of Rule 702. Even if the Court left open the question of applicability to technical and other specialized knowledge in *Daubert*, the Court should adopt a monist standard in *Carmichael* in order to be consistent with the language and purpose of Rule 702 and the *Daubert* opinion itself.

¹⁴⁴ FED. R. EVID. 702, Advisory Committee’s Note.

¹⁴⁵ *Id.*

4. A dualist interpretation would present the possibility of gamesmanship in the selection of experts. Dualism implies two different standards and in the case of expert testimony, a standard of scientific validity for scientific knowledge and a standard of helpfulness for technical and other specialized knowledge. As analyzed in the previous section, a lower standard for technical and other specialized knowledge would create incentives for characterizing a witness as non-scientific or to use expert witnesses that are technical as opposed to relying on outputs of machines, even though the underlying testimony would be identical. A single standard for all expert knowledge would mitigate gamesmanship by litigants.

V. The Preferred Holding in *Carmichael*

The Supreme Court in *Daubert* left unanswered a large question concerning the interpretation of Rule 702. It will resolve that question in *Carmichael*. Everything this author has argued in this paper urges the Court to adopt a monist interpretation of *Daubert*, holding that *Daubert* analysis applies to all expert knowledge, not just to scientific knowledge. Such a holding would be consistent with the language of Rule 702 and of *Daubert*. Such a holding would also be consistent with the gatekeeping function of the trial court under Rule 702.

More importantly, the monist interpretation, currently adopted by six circuits and a few state courts, would be the most honest to non-hard sciences, such as economics or epidemiology, or even the field from which tire experts speak. Each of these fields have their own methodology and techniques; to disregard them in favor of a general helpfulness standard, the most likely result if the Court adopts a dualist interpretation, will lead to the entry of junk social science into the courtroom. On the other hand, subjecting the non-hard sciences to the methodology of the hard sciences overlooks the important methodological differences. The key to understanding Rule 702 is not unfathoming the meaning of the word “scientific”; it is unfathoming meaning of the word “knowledge.” The *Daubert* Court was correct in asserting that assessing the validity of knowledge rests on assessing the validity of the method by which the knowledge was obtained. The *Carmichael* court should reassert this rule of law by holding that all expert knowledge must be subjected to the *Daubert* analysis for *admissibility* under Rule 702.