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# From Frye To Joiner: The Supreme Court Muddies The Waters Of Judicial Reasoning

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The recent Supreme Court decisions in *Daubert* and *Joiner* have created more confusion than they have solved. Both cases ostensibly set out to create a "standard" of expert admissability in Federal Courts. A survey of circuit, district, and state court opinions show that judicial opinions determining expert admissibility, particularly the application of *Daubert's* guidelines, deviate dramatically in analysis and outcome. The *Daubert-Joiner* standard has also failed to give effect to the "liberal thrust" of the Federal Rules of Evidence favoring admissibility and has not advanced any clear policy in creating the new standard.

## I. INTRODUCTION - What is an Environmental Expert?

### A. The Rise Expert Testimony in Civil Litigation

The use of expert testimony in civil cases is a relatively new phenomenon in our legal system. During the last two decades, expert testimony has been used in an ever- broadening sphere of civil cases encompassing such disparate areas of law from negligence to contract interpretation to product liability to damage assessment. Generally, the use of expert testimony can be divided into two broad areas: determination of liability (usually in the context of causation) and determination of damages.

The rise in the use of expert testimony in civil litigation has paralleled the rise of environmental law and its importance in our legal system. The passage of Resource Conservation and recovery Act (RCRA) in 1976, Toxic Substance and Control Act (TSCA) in 1976 and the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) in 1980 [1], created a growing need for scientific analysis of the substances which our society uses and discards everyday. These statutes, as well as budgetary constraints, created the need for "risk assessments" to set environmental priorities (which substances should be regulated) and determine environmental policy (how strict should those regulations be or what level of exposure is "safe"). [2] Risk assessment has created a marriage of science and the law, for better or for worse, which cannot be dissolved.

Initially, the use of science in the law through regulatory agencies did not pose too great a challenge for our legal system or judicial decision making due to the great deference afforded agency decisions. [3] Judges did not have to (though some did) delve too deeply into the scientific methodology underlying agency decisions. Rather, the courts could defer to an agency's better judgment as to matters of science in regulatory policy decisions and statutory interpretation as enunciated in Vermont Yankee Nuclear Power v, NRDC and further developed in Chevron v. NRDC [4]. However, the evolution of the law and science from public decision making to private cause of action has placed a great strain on our system's ability to dispense justice and forced judges to squarely address science in the law.

As the government began to address the fact that exposure to many substances used in our society pose grave health risks, the concept of the "toxic tort" became a part of legal parlance in the seminal decision In re Agent Orange Products Liability Litigation [5]. Once the government established that various substances can be harmful to people or the environment at a certain level of exposure, the inevitable has followed: What happens when a person or property is exposed to known harmful substances above levels determined to be safe? An even more difficult problem is exposure to substances we know little or nothing about. A recent report covering 2,863 organic chemicals produced or imported into the United States above one million pounds annually concluded that there was no basic toxicity for 43% of the chemicals and full toxicity information for only 7% of the chemicals [6]. Toxicologists who were once asked to set exposure levels that are safe are now asked to enter the

courtroom and testify that a person or place exposed to substance X more likely than not was damaged in some way due to that exposure. Other experts have been asked to determine how or how much or even if a person or place was exposed to substance X through the use of "fate and transport models" of exposure.

Such testimony in the context of civil litigation has created a myriad of problems for our judicial system. Judges who know little about the developing areas of toxicological science are forced to make risk assessments of their own to weed out the "junk" from the legitimate science and allocate precious judicial resources to the greatly expanding and time consuming area of toxic torts. The primary tool judges have utilized to allocate judicial resources in toxic tort cases is the admissibility of expert testimony.

**B. Environmental Expert Testimony and Toxic Torts**

An environmental expert, defined in its broadest sense, is one who provides insight as to mans' effects on the environment (the world in which we live) and the environment's effects on man. This expertise is put to use in civil litigation in two areas: causation and damages. Generally, an environmental expert will testify as to (1) the environment's effects on man in toxic torts or toxic tort product liability usually with regard to causation; and (2) mans' damage to the environment. Each general area presents its own significant problems in establishing the extent of liability in a civil case. Therefore, this study will focus on expert testimony in toxic tort/product liability causation, and, to a lesser extent, expert testimony as to damages in these cases [7] . The standards of admissibility in each scenario, causation and damages, differ markedly.

Expert testimony concerning causation has two components: (1) was the plaintiff exposed to substance X; and (2) if so, did the exposure cause the harm asserted by the plaintiff. In many instances, plaintiff need not offer expert testimony with regard to exposure because it can be proven by non-expert evidence or even stipulated, as in the case of product liability. However, even if exposure is a given, proof (or lack thereof) regarding the *level* of exposure can be outcome determinative. The second part of the causation inquiry is the center of most of the debate surrounding expert testimony and was the issue in dispute in both Supreme Court cases Daubert v. Merrell Dow Pharmaceuticals and General Electric Company v. Joiner [8] . How and to what degree of certainty must a plaintiff show that exposure to substance X caused the alleged harm? Not only do toxic tort plaintiffs have to overcome these general inquiries, but plaintiffs must also confront a variety specific problems such as long latency periods from exposure to harm, use of nascent scientific techniques, lack of scientific information, inherent uncertainties in the science of toxicology, and a skeptical public and judiciary.

The issue of assessing environmental damage by experts has also been controversial, but does not have nearly the impact or visibility as toxic tort cases. Though methods of assessing environmental damage are even more speculative in nature and far less accurate than causation methods, plaintiffs need not establish that damages have occurred, only the quantum of the damages. Unlike causation in toxic torts, there is no burden of proof plaintiffs must overcome to allow an expert to give a damage figure to the jury. Expert testimony with regard to both environmental damages and toxic tort causation are, to a degree, speculative and often the only evidence presented. Courts have been far more willing to admit expert testimony with regard to damage assessment and land valuation as compared with causation. Because of the importance of expert testimony in toxic tort litigation and the prevalence of those cases in comparison to land assessment or damage evaluation, the standard of admissibility for toxic tort plaintiffs has received most of the judicial scrutiny.

**C. Standards of Expert Admissibility: From Frye to Joiner**

In United States v. Frye, the District of Columbia Court of Appeals made the following bald assertion regarding the admission of scientific expert testimony:

> "Just when scientific principle or discovery crosses the line between the 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*." (emphasis supplied). [9]

The Court cited no authority or gave any justification for the newly created "general acceptance" standard for the admission of novel scientific evidence. Despite the lack of explanation or underlying reasoning in the Frye opinion, the "general acceptance" standard became the law of the land in both state and federal courts and went unquestioned for nearly a half century.

Beginning with adoption of the Federal Rules of Evidence in 1975 and subsequent state rules, the state and federal courts began to modify the Frye general acceptance test and develop expert admissibility standards based upon traditional evidentiary considerations such as relevancy and reliability. The move away from the Frye test of "general acceptance" was precipitated by several definitional problems associated with "general acceptance in the relevant scientific community." The key terms, "relevant scientific community," and "general acceptance," are vague and susceptible to outcome determinative justification of what the judge believes is credible and incredible scientific evidence. As one commentator noted, "(i)nstead of using Frye as an analytical tool to decide whether scientific evidence should be admitted, it appears that many courts apply its label to justify their own views" as to the admissibility of evidence [10] . Admissibility of scientific testimony often hinged upon the definitions of general acceptance and relevant scientific community. Such formalistic considerations or "mechanical jurisprudence" is anathema in the era of legal realism where opinions are "reasoned" and advance judicial and social goals [11] .

Another criticism with Frye was that the general acceptance standard was too rigid a construct to be applied to the ever-changing world of scientific advancement. The general acceptance standard was well suited to the admissibility of scientific testimony in the context of criminal cases. One of the main criticisms of the Frye standard was the tendency to exclude reliable scientific evidence based solely on its novel nature [12] . But in the context of proving guilt beyond a reasonable doubt, the exclusion of suspect evidence fit in well with the purpose of the heightened burden of proof. Considering the "aura of infallibility" surrounding science, the stringent standard of general acceptance seemed justified when determining guilt or innocence [13] . However, since the Frye standard was applied solely to criminal proceedings, the general acceptance standard's faults did not become manifest until the advent of scientific testimony in civil cases.

Though many state and federal courts began to move away from Frye during the 1970's [14] , a vast majority of courts still used the Frye standard to determine admissibility of novel scientific testimony. But the growth of scientific testimony in civil matters began to undercut the need for a conservative approach to the admission of expert testimony. Freedom was no longer at stake in admitting or denying the admission of expert testimony. Under a more likely than not burden of proof in civil cases, courts should be willing to admit scientific evidence which is more than likely accurate rather than accurate beyond a reasonable doubt.

The patchwork of expert admissibility standards that relied upon Frye, a "modified Frye," or adherence to the Federal Rules of Evidence provided fertile ground for academic, lawerly and judicial commentary during the rise of toxic tort and product liability cases during the 1980's. Growing from this field of commentary was a feeling that juries could not handle the role of assessing credibility of conflicting expert testimony and that courts were increasingly allowing "junk science" to invade the courtroom [15] . The judiciary weighed in to the debate noting that since the adoption of the Federal Rules in 1975, "large expenditures (of judicial resources) for marginally useful expert testimony have become commonplace and these "excesses ... should be curtailed." The judicial committee recommended an amendment to Rule 702 that would require expert testimony to be "reasonably reliable" [16] . Many skeptics of the new expert testimony that was pervading the courts concluded that experts were willing to testify to anything for the right price and gullible juries would be taken in by sympathetic plaintiffs and slick-talking experts [17] .

**[15]** In Daubert, the Supreme Court purportedly established a standard for the admissibility of expert testimony. The Court announced the following rules and "guidelines" with regard to the admission of "scientific" expert testimony:

(1) The trial court must determine whether the proffered expert testimony is relevant (i.e. assists the trier of fact determine a factual dispute);

(2) The trial court must then determine if the proffered testimony is reliable (i.e. constitutes "scientific knowledge" or grounded in sound scientific methodology).

The following guidelines were suggested to determine the reliability of scientific expert testimony:

(a) Can or has the underlying scientific theory or technique been tested?

(b) Has the theory or technique been subject to peer review and publication?

(c) Is there a known or potential rate of error for the technique?

(d) Has the known technique gained "general acceptance" within the field [18] ?

Though the Court intended to settle debate and give order to confusion while developing a better standard than Frye and its progeny, the application of the Daubert standard has created a whole new set of problems without adequately addressing the formalistic quirks of the Frye standard.

Essentially, the Court attempted to replace the old restrictive standards under Frye with a more "liberal" uniform one. The Court replaced the outcome determinative, formalistic role of defining the "relevant scientific community" and what is "novel" evidence with an apparently more reasoned standard based on the Federal Rules of Evidence and sought to provide "guidance" to the lower courts in applying the new standard. The result of the Daubert standard has been a more restrictive standard of admissibility, a patchwork of interpretations of how to apply the Daubert standard, and outcome determinative, formalistic pigeon holing of testimony as "scientific" (apply Daubert) or "technical" expertise (do not apply Daubert). The Court provided further confusion by distinguishing "scientific method" (scrutinize) from scientific conclusion (do not scrutinize) and provided almost no useful guidance as to how a judge, with little or no scientific training, is to determine what is good science and what is bad. In short, the Daubert standard has merely changed, rather than solved, problems under Frye and has created a myriad of new issues which are counter productive in today's courtroom. The inadequacies of the Daubert standard have been further compounded by the Supreme Court's decision in Joiner when they established an abuse of discretion standard of review for the admissibility of expert testimony. Now trial judges are not only empowered to dismiss cases with the exclusion of expert testimony, but their decisions are cloaked in nearly the same security once given only to government agency decisions.

**II. Daubert v. Frye - Which is the harder standard to meet?**

The Supreme Court declared in Daubert that its decision was based on the "liberal thrust" of the Federal Rules of Evidence with regard to admissibility. At the time Daubert was decided, commentators had high expectations that the decision would loosen the strictures of admissibility based on general acceptance [19] . In practice, the Daubert standard has resulted in much higher hurdle to overcome to admit scientific expert testimony. A random sampling of decisions at the federal and state level [20] underscores the chilling effect Daubert has had on admitting expert testimony.

In 73 federal product liability/toxic tort cases since 1994 where the plaintiff has sought to admit expert testimony on causation, the district courts admitted only twenty- three experts. Similarly, the federal appellate courts allowed only ten of thirty-one experts to testify as to causation. In state courts that use Daubert, the percentage is slightly higher with ten of twenty-five experts allowed to testify. However, two of the ten experts did not have to pass the Daubert standard because the courts found that Daubert did not apply to their "technical" testimony. When the state courts actually applied the Daubert standard, the admissibility rate of expert testimony is in line with that of the Federal courts: only one in three experts are permitted to testify under the Daubert standard [21] . However, state courts which do not apply the Daubert standard, but use Frye and its progeny to determine admissibility, fourteen of twenty causation experts were permitted to testify in products liability and toxic tort cases!

Though this crude sample is illustrative of courts which are more skeptical of expert testimony in the post-Daubert world, how courts apply the Daubert, Frye and modified Frye standards as well as the short comings of each is far more telling as to which standard is more difficult to satisfy. Generally, the criticisms of the Frye standard that led many courts to adopt different standards were (1) the problems of defining "general acceptance;" (2) what must be "generally accepted;" (3) the definition of "relevant scientific community;" and (4) when to apply the Frye standard (i.e. what is "novel").

**A. The Frye Standard**

As articulated by numerous courts, the Frye standard for admissibility of "novel" scientific expert opinion is whether the opinion has gained "general acceptance" within the "relevant scientific community." First, the court must determine if the proffered expert or scientific evidence is novel, or if the Frye test should apply at all. Historically, whether or not to apply the Frye test has been uneven from jurisdiction to jurisdiction and even within a jurisdiction. Most courts do not even consider this as a separate step in the application of Frye and move directly to determining whether the scientific evidence has been generally accepted [22] . In Sheridan v. Catering Management [23] , the court found that the Frye test does not apply when there has been no claim that the scientific method or process employed is novel. The court went on to conclude that there is nothing novel in a physician's testimony regarding exposure to toxic chemicals in the workplace as a cause of the plaintiff's injury [24] . How a court classifies a particular method or science is virtually outcome determinative under Frye. If the method is not "novel," then there is no need to show general acceptance and the evidence will be admitted as long as it is relevant [25] .

Next, the court must determine what must be generally accepted, the scientific methodology or the conclusions reached by applying that methodology or both. Some courts have held that the underlying methodology must be generally accepted [26] . Others have applied the general acceptance test to the conclusions reached by the expert [27] . And still other courts insist that both the methodology and conclusion must be generally accepted [28] .

There can be little doubt at this time that differential etiology, differential diagnosis, epidemiology and even animal studies are generally accepted by the scientific community as predictors of toxicity. Most courts have not applied the general acceptance test to the methodology per se, but rather the application of that methodology by the particular expert [29] . In so doing, the distinction between "methodology" and "conclusion" is certainly blurred to the point of being a distinction without a difference. In a unique approach of Blum v. Merrell Dow Pharmaceuticals, the court seemed to apply two different standards regarding the general acceptance of the conclusions and methodology employed by an expert asserting Benedictin caused limb reduction. The court noted that there was no general acceptance of the conclusion that Benedictin causes limb deformities [30] . The court noted further that the methodology employed to reach this conclusion was not "universally accepted as good science [31] ."

Not only have the courts struggled with what must be generally accepted, but how to determine general acceptance. The courts have used a variety of methods to determine what constitutes general acceptance [32] . The existence of published literature on the theory or conclusion is one method [33] . Other courts have "counted heads" and determined that a "small segment" of those in the relevant community is not enough to satisfy general acceptance, but "substantial acceptance" is enough [34] .

Finally, the courts must determine what constitutes the "relevant scientific community." Often such a determination can be difficult because scientific methodologies often incorporate more than one field of science. As one commentator points out, selecting the relevant community is often both difficult and dispositive [35] . In the case of toxic torts, toxicologists will certainly view the extrapolation of animal testing toxicity to human toxicity more readily than the medical community at large. Just as with the "novel" prong of the Frye inquiry, courts often do not discuss the reasoning process of determining the relevant scientific community, but just baldly assert that the particular method, technique, process or conclusion either is or is not generally accepted [36] .

A clear thread that seems to run through all of the Frye decisions is the lack of reasoned analysis as to why a particular piece of scientific evidence meets or does not meet the Frye test and why the Frye test

should apply or even what the Frye test is actually testing - the scientific method or the conclusion drawn? The lack of reasoned explanation or consistent application has led to differing results between jurisdictions and erratic results within jurisdictions [37] . An example of how malleable the Frye test can be in application is Coppolino v. State [38] , where the court found that a new test developed solely for that case was admissible under Frye. The general scientific community had not even heard of this new technique, let alone "generally accepted" it!

Though the Frye test suffers from difficulties with courts using and defining key terms such as "novel," "scientific community," and "general acceptance" differently, these problems are not technical ones and can be readily addressed by lawyers and judges alike. The proponent of scientific evidence need only overcome one hurdle to have proffered scientific evidence admitted: is the method or conclusion generally accepted by the relevant scientific community? To overcome this hurdle, the lawyer is equipped with several tools to ensure a favorable result. First, the proponent can assert that the scientific evidence is not "novel" and therefore the Frye test does not even apply (i.e. the method is worthy of judicial notice and the court must only analyze the qualifications of the expert and relevancy of the evidence offered). Next, the lawyer can manipulate what must be generally accepted, steering the court toward more favorable categories (i.e. the methodology if the conclusion is controversial or vice versa). Finally, the narrowing or broadening of the relevant scientific community can also be used. Similarly, those jurisdictions that use a modified Frye approach often trod on familiar ground for trial attorneys and judges and are far more likely to succeed in getting scientific or expert testimony admitted.

**B. Modified Frye - Rules of Evidence Approach**

Jurisdictions that rejected the Frye standard prior to Daubert or modified the Frye standard did so based largely on the adoption of the Federal Rules of Evidence and subsequent adoption of similar rules on the state level. Generally the test for admissibility under the rules or modified Frye standard is a three prong test that encompasses: (1) relevancy of the testimony; (2) reliability (or general acceptance); and (3) probative value of the evidence versus its prejudicial effect [39] . Those courts that retained the Frye inquiry equated the Frye general acceptance standard with reliability [40] . Those that did not, analyzed the methodology employed and the data supporting the opinion under Rule 703 to determine reliability [41] . Courts generally have equated relevancy with helpfulness to the trier of fact as embodied in Rule 702. With regard to helpfulness, the inquiry goes to whether an expert is necessary to assist the trier of fact understand the particular issue for which the evidence is offered. On this basis, there have been some conflicting results with the admissibility of testimony [42] . Unlike Frye, in these cases it is readily apparent why evidentiary rulings ended in different results.

In United States v. Downing, the court admitted testimony regarding the accuracy of eyewitness testimony because the testimony offered would be helpful in assessing the accuracy of eyewitness testimony in general. The testimony went to factors that effect memory and recall. The court reasoned that expert opinion regarding eyewitness testimony would be helpful because cross-examination would be ineffective due to the strong belief of an eyewitness that he or she was correct. The court also noted that the testimony went to general considerations of evaluating eyewitness testimony and, finally, the case rested solely on eyewitness testimony [43] . In United States v. Fosher, the court did not allow similar testimony because the testimony went directly to determining the credibility of eyewitnesses and found that this testimony intruded on the province of the jury [44] .

**[29]** Since the admissibility standards for these jurisdictions were based solely on the Rules of Evidence and their "liberal thrust" and assumptions of admissibility (e.g. Rule 402), the courts seemed to keep these considerations in mind when applying the Rules. Most jurisdictions using the Rules of Evidence as a basis for expert admissibility focus their inquiry on the helpfulness to the jury, the data underlying the offered opinions and the danger of jury confusion or prejudice. All of these concepts are within the traditional keen of lawyers and proponents of such evidence can readily translate the evidence they wish to submit into these terms. As for helpfulness, the proponent of the evidence need do little more than give the reason for the expert testimony and why such testimony would assist the trier of fact. Reliability under the rules often entails a cursory look at the methodology employed, with any error or deviation in the application of the methodology by the expert going to weight rather than admissibility. If the proffered evidence passes the helpfulness and reliability prongs of the expert testimony, there is little chance of expert evidence being excluded due to prejudice.

**C. Daubert to Joiner**

In Daubert v. Merrell Dow Pharmaceuticals, the Supreme Court attempted to create a single standard of expert admissibility based upon the Federal Rules of Evidence. In so doing the Court ended the reign of the "rigid" general acceptance test because it was "at odds with the liberal thrust of the Federal Rules," noting:

> "Frye made general acceptance the exclusive test for admitting expert scientific testimony. That austere standard, absent from, and incompatible with, the Federal Rules of Evidence, should not be applied in federal trials [45] ."

The Supreme Court interpreted the rules to include several steps the trial court must use to ensure that evidence admitted is "not only relevant, but reliable [46] ." The Court pulled the reliability test for expert testimony from Rule 702. The Court found the use of the words "scientific" and "knowledge" in Rule 702 "implies a grounding in the methods and procedures of science," requiring a trial court to delve into the "science" underlying an expert's opinion to make sure that opinion is based on "good grounds [47] ." The trial judge must also ensure that the testimony is relevant (i.e. will assist the trier of fact under Rule 702). This two step process "entails a preliminary assessment of whether the reasoning or methodology underlying the testimony is "scientifically valid" or reliable [48] . Going beyond the issue presented, the Court then applied this standard to the Daubert case and set out some "general observations" as to where a trial court should look to determine scientific validity [49] . Though not designed to be a "definitive checklist," the Court noted four factors: (1) testability of the theory or methodology; (2) whether the technique or theory has been subjected to peer review; (3) the rate of error of the methodology; (4) general acceptance in the relevant scientific field. Finally, the Court cautioned that the focus of the inquiry "must be solely on principles and methodology, not on the conclusions they generate [50] ."

In General Electric v. Joiner, the Court further clarified the role of trial judges as "gatekeepers" in admitting scientific evidence into court. First the Court announced that appellate review of expert testimony admissibility is limited to an abuse of discretion standard. Though this was the only issue before the Court, the Court went beyond the issue presented and declared that the trial court in this case did not abuse its discretion [51] . The Court found that, though the trial court may have denied admission of the expert's testimony based upon the expert's conclusions rather than the expert's methodology, "conclusions and methodology are not entirely distinct from one another... a court may conclude that there is simply too great an analytical gap between the data and the opinion proffered [52] ."

The combination of the Daubert and Joiner decisions have not only created an intricate task for the trial court to carefully review the underlying methodology of proffered scientific opinion, but have also given them free reign to disallow expert testimony based upon an expert's conclusion. The result of these decisions is a widely varying application of the Daubert standard from circuit to circuit and district to district. State courts that have adopted the Daubert standard have an even more erratic track record. Despite basing the Daubert and Joiner standards upon the "liberal thrust" of the Federal Rules and it's assumption of admitting evidence, the Daubert standard has had a chilling effect upon the admission of scientific evidence in some jurisdictions, been ignored by others, and misread by still more.

The Daubert test for the admissibility of expert witnesses is based primarily upon the Federal Rules of Evidence 702. Once the proposed witness has been qualified as an expert pursuant to Rule 701, the court must then find that the expert's underlying methodology is scientifically sound or reliable and the testimony will assist the trier of fact to understand or determine a fact at issue [53] . In analyzing this methodology, a judge must also keep in mind Rule 703, which requires that the underlying data upon which the expert relies must be the kind of data that experts in the particular field reasonably rely upon in applying the particular methodology. If the court finds that the qualified expert applies a scientifically valid methodology using data which is reasonably relied upon by experts in the field which is helpful to the trier of fact, then the expert's testimony is theoretically admissible under Daubert. However, in the context of toxic tort or, more generally, expert opinion as to causation, the application

of the first prong of Daubert is a multi-step process which can be extremely difficult to overcome and more often than not, is outcome determinative.

In toxic tort cases, the plaintiff normally must show (1) that he or she was exposed to a toxic substance; (2) exposure to the toxic substance is known to have caused the type of injury suffered by the plaintiff (general causation); (3) the toxic substance did in fact cause (specific causation); (4) damage to the plaintiff. Much of the proof for each of the above elements must come in the form of expert testimony. By applying Daubert to each element of expert testimony, the plaintiff must make a detailed showing that the expert which testifies applies sound science (as opposed to "junk science") every step of the way.

**1. Exposure**

Determining the exposure level, or whether plaintiff was exposed at all, to a toxic substance is vital to a toxic tort case. People do not go around with monitors that measure exposure to toxic substances. Further, the latency period for any damage which may be caused by exposure to a toxic substance can be years, if not decades. Even if exposure to a particular toxic substance is a given, establishing the level of exposure to the toxic substance is often difficult. Finally, establishing a harmful level of exposure can be impossible if animal studies are found to be inadmissible or unreliable [54] .

Applying Daubert to theories of exposure can often result in the exclusion of an entire expert's opinion regarding causation. Even if an expert can determine through particular facts that there was exposure, the inability to show an exposure level can prove equally fatal. In Moore v. Ashland Chemical [55] , the Fifth Circuit, ruling en banc, overturned an appellate decision holding that the trial court abused its discretion by excluding a treating physician's testimony regarding exposure to Toluene. The proffered expert testimony in Moore concerned a one time exposure to Toluene for approximately one hour [56] . The company's safety data sheet warned that "Inhalation: short vapor exposure may cause drowsiness and irritate nose and throat. Vapors may injure blood, liver, lungs, kidneys, and nervous system. Degree of effects depends on concentration and length of exposure [57] ."

After summarily discrediting several factual bases for the expert's opinion, the court addressed the expert's reliance on the above safety data and a case study on exposure to Toluene. The court first discounted the expert's reliance on a published case study noting the link between exposure to Toluene and RADS (reactive airway dysfunction syndrome) because "the level and duration of exposure (of the study) was several times greater (2 1/2 hours) than Moore's exposure (one hour) [58] ." The court then went on to discredit the expert's reliance on the manufacturer's safety data noting that "(b)ecause [the expert] had no accurate information on the level of Moore's exposure to the fumes, Dr. Jenkins necessarily had no support for theory that the level of chemicals to which Moore was exposed caused RADS [59] ." In finding that the district court did not abuse its discretion in excluding Dr. Jenkins expert testimony, the court stated:

> "None of Daubert's factors to assess whether the opinion was based on sound scientific principles was met. Dr. Jenkins theory had not been tested; the theory had not been subjected to peer review or publication; the potential rate of error had not been determined or applied; and the theory had not been generally accepted in the scientific community. In sum, Dr. Jenkins could cite no scientific support for his conclusion that exposure to any irritant at unknown levels triggers this asthmatic-type condition. Under the Daubert regime, trial courts are encouraged to exclude such speculative testimony as lacking any scientific validity [60] ."

The court also stated that, even if Dr. Jenkins had scientific support that Toluene could cause RADS "in a worker exposed to some minor level of the solution," his causation testimony would be suspect "(g)iven the paucity of facts Dr. Jenkins had available about the level of exposure to the Toluene solution [61] ."

Apparently, the Fifth Circuit would require that, before a toxic tort plaintiff can recover for exposure to a toxic substance, no matter how much evidence of the link between damage and toxic substance, the

plaintiff must show the level of exposure with scientific accuracy. In this case, arguably a fate and transport model could be constructed since the amount of time of exposure was known and discrete. But even if an exposure level could be determined with scientific accuracy, such value would still need a context. What is a "minor level" of exposure as compared to a "major level" of exposure will vary chemical to chemical. So the expert would also need a much larger study determining what levels of exposure are safe, what levels cause irritation and what levels cause RADS. Such major studies are difficult if not impossible to come by, even using EPA studies that are usually based on animal tests.

Does Daubert require such precision in determining exposure levels? Fortunately several circuits disagree with the Fifth Circuit regarding exposure. Some courts have allowed the extrapolation of exposure data from high exposure to low exposure [62] . However, other courts have noted the establishment of exposure levels, reliance on exposure data that was different than that which plaintiff was exposed, and reliance on extrapolation of animal exposure data all to be insufficiently reliable [63] . Most opinions regarding expert opinion admissibility in toxic tort cases do not focus their analysis on exposure, but rather use insufficiencies in exposure data to buttress their exclusion of causation testimony.

**2. General Causation**

**[40]** Though most courts that analyze expert opinion evidence regarding causation do not distinguish between general and specific causation, the difference is significant and can have a major effect on the admissibility of expert testimony. General causation is the proposition that substance A more likely than not causes harm B in humans. Specific causation is the proposition that substance A caused harm B to the plaintiff.

Different forms of expert testimony seem to be more readily admitted for different propositions. Based on a review of several cases, a trend emerges where experts which try to testify "too much" (i.e. to both general and specific causation) are often excluded. An excellent example of this trend is the Benedictin cases. Since the causes of limb reductions and birth defects are largely unknown, the plaintiffs cannot use traditional methods of establishing specific causation (i.e. diagnosis). Therefore, the plaintiffs had to rely upon animal studies and epidemiological reevaluations to establish both general (Benedictin causes birth defects) and specific (Benedictin more likely than not caused the plaintiffs' birth defects) causation.

Experts which limit their testimony to either general (using epidemiology) or specific (differential etiology or diagnosis) causation have a greater likelihood of admission. Animal studies are better suited to prove general causation than specific causation and have a much better chance of being admitted if used to show only general causation [64] as do reanalysis of epidemiological data [65] . Similarly, uses of a treating physician to establish specific causation is more likely to be admitted.

**3. Specific Causation - Is there a doctor in the house? The use of differential diagnosis in the courtroom**

Differential etiology or differential diagnosis is the process of eliminating factors which could cause a particular disease until only one is left, or at least one factor is more likely than not to have cause the disease. A treating physician or an expert who has reviewed the case with the treating physician usually performs differential etiology diagnosis. Many courts have found that the methodology is sufficiently reliable and prevalent among treating physicians to allow such specific causation testimony to be admitted [66] . Though the acceptance of diagnosis is not universal [67] .

The use of differential etiology will, and often must, depend on other scientific studies for support. The support necessary for a diagnosis-based theory is usually less than other modes of causation analysis under Daubert [68] . Underlying general causation support for diagnosis causation will often be nothing more than a scholarly article or two which supports that exposure to substance A is related to some harm B which is similar to the harm suffered by the plaintiff. How much support is necessary for diagnosis causation and how close the fit between the general causation proof and the plaintiff's harm varies jurisdiction to jurisdiction.

**4. Damages in Environmental Torts - Relaxation of Environmental Experts**

In some cases, such as workers compensation and disability, the plaintiffs expert testimony will go to damages caused by work related exposure. In these cases, proof of the condition rather than what caused the condition is most important. Plaintiff need only show that the work exposure was a contributing factor of the harm, which can usually be satisfied by general causation and/or diagnosis causation. Almost all courts relax the strictures of Daubert in these cases and allow treating physicians to testify in workman's compensation and disability cases, even though some of the expert theories had been thoroughly rejected in other courts [69] .

When environmental experts testify as to the damage or value of land, the Daubert standard, if applied, is greatly relaxed. A critical step to assessing damages to land is establishing the land's market value. Assessing the reliability of land valuation methods is difficult because "there is no fixed method for determining [market] value [70] ." Yet a value must be placed on damages to land, natural resources, aesthetic value, resale value and potential market value under statutory directive [71] . Land values must also be established in eminent domain actions. In these cases, the courts have allowed testimony as to damages by not applying the Daubert standard with any type of rigor [72] .

**III. How should the standards of Daubert and Joiner apply to "technical" expert witnesses versus "scientific experts"?**

**A. The Rules of Evidence and the Daubert Factors**

As far as Daubert interprets the rules of Federal Evidence, the opinion has had some unifying force in requiring courts to apply the rules rather than the Frye general acceptance test. Courts that apply the Rules and keep in mind the over-arching "liberal thrust" of those rules should be able to apply the Daubert standard to any expert. Certainly the requirements of reliability and relevance should apply to all experts and all experts should base their opinions only on data that other experts in their field would use in forming opinions.

As for the Daubert factors of testability, peer review, error rate and general acceptance, these factors seem to have little, if any, practical importance for scientific or any other form of expertise. The courts have struggled with the application of these factors, applying them to every expert, only scientific experts, or using the factors selectively based on an expert's field and methodology. Several courts have refused to apply the Daubert test to technical or other non-scientific expert testimony [73] . Overall there is an extraordinary reliance on these factors that are nothing more than dicta, at best, and an advisory opinion that should have no weight, at worst [74] . Due to the misapplication of these factors and how the Supreme Court promulgated them, the Daubert factors should have no weight nor be used at all in determining expert admissibility.

In Daubert, the Court granted certiori "to determine the standard for admitting expert scientific testimony in a federal trial [75] . Specifically, petitioners asked whether the Frye rule of general acceptance survived the enactment of the Federal Rules [76] . The Court agreed with petitioners that the Frye Rule was superseded by the Federal Rules of evidence and found that Rules 701-703, 104(a) and 403 were the test for admissibility. The Court went further to note that because Rule 702 uses the word "knowledge," courts should also inquire into the reliability of an expert's underlying methodology.

However, the court cautioned that the judge, when not the trier of fact must not assess the reliability of the experts conclusion, but merely the method or process by which the conclusion was generated. To do more would be to invade the province of the jury and determine the credibility of the expert. The Court found that the Federal Rules embody a presumption that "(a)ll relevant evidence is admissible [77] ". The Court also noted that previous Supreme Court decisions confirmed that the Federal Rules take a "general approach of relaxing the traditional barriers to opinion testimony [78] . The Supreme Court clearly enunciated the primary policy of overruling Frye and requiring the courts to use the Federal Rules - to give effect to the "liberal thrust" of the Federal Rules and eliminate reliance on a "rigid" general acceptance standard at odds with the flexible approach of the Federal Rules. Though the court went on to describe in detail the gatekeeper role of the trial judge to ensure expert testimony is relevant

and reliable under Rule 104(a), the Court curiously neglected to caution judges to "consider all evidence presented" in determining admissibility and that "(i)ndividual pieces of evidence, insufficient in themselves to prove a point, may in culmination prove it. The sum of an evidentiary presentation may well be greater than its constituent parts [79] ." Since the Supreme Court declined to instruct trial judges to "consider all evidence presented" as a whole in determining whether expert evidence is admissible, the courts have almost uniformly analyzed the underlying method and evidence which supports an expert opinion piece by piece. This approach as invariably led to the exclusion of expert testimony. In the context of toxic torts, courts should consider the "weight of evidence" in total to support expert opinions [80] . Given the blind adherence to the Daubert factors by some of the lower courts [81] , courts similarly follow the piece-by-piece approach of analyzing the underlying authority for an expert's opinion.

Applying Daubert's factors has the same effect. By assessing a particular methodology factor by factor rather than looking to the rational or policy behind the Daubert factors and determining suitable factors for the particular expert testimony, courts have essentially waived their responsibility to adjudicate in a reasoned fashion. Strict adherence to the Daubert factors and applying such factors to technical experts as well as a wide range of "scientific" experts is nothing more than judicial formalism, a mode of adjudicating which has been thoroughly discredited and out of favor for nearly a century.

**B. The Daubert Standard and "Technical" Experts**

Many courts and circuits have noted and refused to apply the Daubert standard to "technical" or experience-based expert testimony. Generally these courts have reasoned that Daubert, particularly the Daubert factors, only apply to "scientific" experts [82] . With other types of experts, the court need only use the Federal Rules to determine admissibility. The result of this reasoning has led courts to avoid two components of the Daubert standard, the Daubert factors and the inquiry into the reliability of the underlying method of the expert - the two most controversial aspects of Daubert. The fact that so many judges would proceed along such a disingenuous course to the point of asserting that engineers, treating physicians and a host of other types of experts are not "scientific" should show even the casual observer that lower courts have found the Daubert standard too restrictive to apply in a variety of circumstances [83] .

Recently, in Kumho Tire v. Charmichael [84] , the Supreme Court had a chance to revise the Daubert standard. Unfortunately, the Court did not repudiate the Daubert factors. Rather, the Court held that the trial judge must determine the reliability of all experts and left the decision of whether to apply the Daubert factors to the discretion of the trial judge. It remains to be seen what effect additional discretion will have on the application of Daubert, but given the problems enumerated above, there is little chance that additional discretion will improve the application of the Daubert standard.

**IV. In view of Daubert and its progeny, what role does the Seventh Amendment reserve to the jury in evaluating expert testimony?**

**A. The Daubert Standard**

On its face, the Daubert standard theoretically leaves much to the jury for assessment. As many courts have interpreted the Daubert standard, the touchstone of reliability is helpfulness to the trier of fact. Given that the Supreme Court also paid lip service to the liberal thrust of the Federal Rules, one may conclude, as did many commentators at the time the Supreme Court handed down Daubert, that the new standard of relevance and reliability would lead to an increase in expert testimony admissibility [85] . As long as the proffered expert testimony is relevant (i.e. related to a fact at issue) and based upon facts reasonably relied upon in the expert's field, reliability of the testimony and underlying methodology seem to follow. However, in practice the reliability prong has taken on a life of its own, particularly when Daubert's "guidelines" or factors are put into play.

Trial judges have effectively used the Daubert factors and the notion of reliability to pass judgment on the credibility of expert witnesses and their conclusions, using the veil of science and intellectual rigor to mask this trend. In Paoli II [86] , the court stated that:

> "(w)hen a judge disagrees with the conclusions of an expert, it will generally be because he or she thinks that there is a mistake at some step in the investigative or reasoning process of that expert. If the judge thinks that the conclusions of some expert are correct, it will likely be because the judge thinks that the methodology and reasoning process of the other expert are superior to those of the first expert. This is especially true given that the expert's view that a particular conclusion "fits" a particular case must itself constitute scientific knowledge - a challenge to "fit" is very close to a challenge to the expert's ultimate conclusion about the particular case, and yet it is part of the judge's admissibility calculus under Daubert [87] ."

The conclusion in Paoli II that analysis of an expert's opinion is a part of the Daubert "calculus" is completely disingenuous. Nowhere in Daubert does the Supreme Court include analysis of an expert's conclusion in the Daubert test, nor does the Court equate "fit" with "scientific knowledge." In fact, the Daubert opinion warns that "(t)he focus, of course, must be solely on principles and methodology, not on the conclusions they generate [88] ."

The Daubert opinion also made clear the meaning of "fit" in the context of admissibility. The "fit" of particular expert testimony goes to the *relevance* (i.e. assist the trier of fact resolve a factual dispute) of the scientific evidence to the fact in dispute, not the reliability or "scientific knowledge" as the Third Circuit stated. To emphasize this distinction, the Supreme Court stated that "scientific validity for one purpose is not necessarily scientific validity for other, unrelated purposes [89] . In expounding upon this statement the Court noted that the study of the phases of the moon, a valid scientific pursuit, would be relevant if the fact in dispute was "whether a certain night was dark," but irrelevant to show the behavior of an individual on that night [90] . Though such a distinction does technically embrace the conclusion of the expert, the court in this example is only making a cursory inspection of the "fit" between the method, conclusion and fact at issue. In Paoli II, doctors relied in varying degrees on scientific literature, diagnosis, and reviews of medical history to conclude that exposure to PCB's caused the plaintiffs harm. Though the court may have a problem with the methodology of some experts and not others, clearly the expert testimony is relevant and "fits" the case.

What the Third Circuit advocates in Paoli II is that trial judges should be allowed to weigh the merits of competing expert conclusions, chose the one with which the judge agrees and exclude that which he does not. Clearly such an analysis invades the province of the jury's role of assessing credibility. The language of the Third Circuit's justification belies the undermining of the jury's role. The Court would allow a judge to exclude an expert opinion when "the judge disagrees with the conclusion," and admit the conclusion of another expert which she feels is correct. Fortunately, the blurring of methodology and conclusion to the point of assessing the credibility of expert witnesses has not yet achieved widespread support among other circuits [91] .

**B. Closing the Door - The Joiner Standard**

Picking up on the rational of Paoli II, the Supreme Court declared in Joiner that "conclusions and methodology are not entirely distinct from one another," therefore "(a) court may conclude there is simply too great an analytical gap between the data and the opinion proffered [92] ." Giving no rational for this analysis nor any reason for discarding Daubert's distinction between methodology and conclusion, Joiner placed the ultimate question of the credibility of an expert witness at the discretion of the trial judge. Since Joiner also held that the standard of review for expert exclusion is an abuse of discretion, Joiner has effectively sanctioned the judicial determination of an expert's credibility.

If Joiner only affirmed judicial encroachment upon an area uniquely within the province of the jury, it would not be too troubling in the context of the Seventh Amendment. Recently the Supreme Court has taken steps too limit the jury's role in other significant ways such as judicial review of punitive damage awards and patent construction [93] . However, in sharp contrast to punitive damage review or patent interpretation, excluding expert testimony in toxic tort cases is almost always outcome determinative. Though a judge may significantly tilt the playing field in favor of a party through patent interpretation, the jury will still receive those instructions, deliberate and find for plaintiff or defendant. The right to trial by jury is vindicated.

However, in the context of toxic tort cases, judicial usurpation of a traditional juror duty has the effect of barring plaintiff's case from the jury. Without expert testimony on causation, plaintiff simply cannot prove his case. Plaintiff invariably lose on summary judgment without expert testimony and never reach the jury's ear. Conversely, if a plaintiff has reliable scientific evidence in the form of well documented studies on both plaintiff's disease and the toxic substance involved and reliable exposure data, what is the chance this case will go to a jury and not settle? The prospect of prolonged pre-trial Daubert hearings, exorbitant expert fees and back logged court dockets create almost irresistible pressure for both defendant and plaintiff to settle the case. In effect, the guarantee to trial by jury in toxic tort matters is illusory. More often than not the right of a jury trial depends greatly upon the whims of trial judges from jurisdiction to jurisdiction. The combined effect of Daubert and Joiner on toxic tort suits cannot have gone unnoticed. So the real question that remains is: Was the restriction of toxic tort causes of action intended and, if so, why?

**V. Conclusion - The Application of Daubert and Joiner and their effect on the Judicial Process**

**A. The Purpose of Daubert and Joiner**

To find the purpose behind Daubert and Joiner, the analysis should begin where the Court granted certiorari on the cases. According to the Rules of the Supreme Court, the Court considers several factors when deciding to grant certiori [94] . The only reason applicable to Joiner and Daubert was that the "United States court of appeals has entered a decision in conflict with the decision of another United States court of appeals on the same important matter [95] ." As discussed *supra*, the courts of appeal were split on the issue of whether Frye survived the Federal Rules of Evidence at the time of Daubert and the standard of review of expert testimony admissibility at the time of Joiner [96] . Both the Daubert and Joiner opinions note that the issue presented was the standard of admission of expert testimony in a federal trial (Daubert) and the standard of review of admissibility rulings.

In judging whether the Supreme Court has succeeded in clarifying existing law through the development of a single standard, one would look to see if the lower courts have consistently applied these standards. As discussed throughout, courts have taken divergent approaches in applying the Daubert standard. Though not enough time has elapsed to truly measure how lower courts will treat the abuse of discretion standard, the divergence of application of Daubert is instructive. Appellate courts which have taken Daubert's caution not to apply admissibility standards to expert conclusions will likely have a different notion of "abuse of discretion" and find the lower courts have abused their discretion more readily than circuits that have placed their stamp of approval on trial courts excluding evidence based on an expert's conclusions [97] .

As further evidence of discord among the circuits, the Supreme Court had to settle another "standard," does the Daubert standard apply to technical expert testimony? In Kumho Tire Co. v. Charmichael, the Supreme Court ruled that the Daubert standard applies to all expert testimony, including determination of the reliability of all expert methodology. The Supreme Court left application of the Daubert factors in a particular case to the discretion of the trial court [98] . Again, given the divergent views of the circuits as to when the Daubert factors apply, undoubtedly circuit courts that disapprove of the use of the Daubert factors in a particular context prior to Kumho will be more likely to find a trial court has abused its discretion in applying them, than a circuit that has consistently applied the Daubert factors to all expert testimony.

In short, Daubert and its progeny have not provided a "standard" which lower courts can apply nor wish to apply consistently. Nor does Daubert rectify any of the old problems with the Frye standard. The vagueness of "general acceptance" and "relevant scientific community" under Frye have changed to different, vague terms under Daubert. The Daubert standards of "scientific knowledge," "methodology" and "scientific reliability" are every bit as opaque as the Frye terminology. The "rigid" (i.e. conservative) Frye standard has given way to the "liberal thrust" (i.e. conservative) Daubert standard. The manipulation of formalistic categories under Frye continues under Daubert. Where once courts defined scientific communities and general acceptance to suit their needs, the Daubert courts now manipulate the definition of "scientific expert," "technical expert," "methodology" and "conclusion."

The next inquiry is whether the Daubert standard has furthered explicit policy goals of the Supreme Court in formulating the new standard. In Daubert, the only explicit policy goal was to give effect to the "liberal thrust" of the Federal Rules favoring admissibility of relevant evidence. In this regard, the Daubert standard has also failed as exclusion of scientific evidence is far more likely under the Daubert regime than under the Frye standard.

Another justification for Daubert's austere admissibility standards is shown in Justice Breyer's concurrence in Joiner. Justice Breyer states that it is "particularly important" that "judges fulfill their Daubert gatekeeping function, so that they help assure that the powerful engine of tort liability, which can generate strong financial incentives to reduce or eliminate, production, points toward the right substances and not destroy the wrong ones [99] ." However, Breyer does not explain how the decision in Joiner furthers this policy. In fact, the Joiner decision seems to run counter to this policy consideration because the determination of tort liability could very well hinge upon the discretion of one judge under the Daubert-Joiner regime. How can a system where the key to the "powerful engine of tort liability" is given to a single judge to use at his discretion, be expected to point to the "right substances?"

Nor does the Daubert-Joiner standard fit well with existing law and policy. The overriding goals of tort law are to compensate and deter tortious conduct. Tightening the admissibility requirements of experts will work against these policy goals in toxic tort cases by creating a lower incentive for toxic substance producers and users to use reasonable care. Further, the decisions will be a disincentive for producers to increase the body of scientific knowledge as to the toxicity of their products. As discussed above, the Daubert emphasis on reliability cannot be squared with previous Supreme Court ruling in Barefoot v. Estelle [100] , nor is tightening requirements for expert admissibility consistent with the Seventh Amendment in toxic tort cases.

Finally, the Daubert standard fails to advance general goals of judicial decision-making. Pre-trial Daubert hearings squander precious legal resources to determine if an expert's testimony is reliable. Daubert has also created the need for plaintiffs to expend a far greater amount of time and money preparing for intensive pre-trial screening, adding more experts and greater amount of time needed for testimony and report preparation. Given the varying admissibility standards from circuit to circuit and federal to state courts, the Daubert standard cannot be seen as advancing fairness. Perhaps the only legitimate judicial goal Daubert and its progeny further is that of finality. Once the powerful engine of the Daubert test is engaged at the discretion of the trial judge, the plaintiff's case is final.

**B. What is an Environmental Expert Revisted**

In conclusion, it appears that an environmental expert is whatever the trial judge, in her discretion, decides.

1. RCRA 42 U.S.C. Secs. 6901-6987; TSCA 15 U.S.C. Secs. 2601-2629; CERCLA 42 U.S.C. Secs. 9601-9675

2. See William Ruckelshaus, Risk in a Free Society, 14 Envtl. L. Rep. 10190 (1984). As EPA administrator, Ruckelshaus asserts that the only way for the EPA to rationally regulate given the EPA budget constrictions is to assess the risks of regulatory targets and address those which pose the greatest risks first. See also Rena I. Steinzor and William F. Piermattei, Reinventing Environmental Regulation via the Government Performance and Results Act: Where's the Money? 28 Environmental Law Reporter 10563,10567 (1998) (decreasing spending power of EPA 1980-1984).

3. See Chemical Manufacturers Association v. EPA, 859 F.2d 977 (D.C.Cir. 1988) (EPA must show only Amore than theoretical probability@ to regulate chemical under TSCA).

4. Vermont Yankee Nuclear Power Corp. v. NRDC, 435 U.S. 519 (1978) (agency policy decisions need only comport with minimal requirements of Administrative Procedures Act); Chevron USA Inc. v. NRDC, 467 U.S. 837 (1984) (deference to agency's "reasonable" interpretation of statute as long as interpretation is permitted by statutory structure). Taken together these decisions essentially allow agency interpretations unless they are "arbitrary and capricious."

5. 506 F.Supp. 737 (E.D.N.Y. 1979). See Robert F. Blomoquist, American Toxic Tort Law: An Historical Background, 1979-1987. 10 Pace Envtl. L. R. 85 (1992).

6. EPA Analysis of Test Data Availability for HPV Chemicals, 22 Chem. Reg. Rep. (BNA) 261 (May 1, 1998). See also Environmental Defense Fund, Toxic Ignorance: The Continuing Absence of Basic Health Testing for Top-Selling Chemicals in the United States. 16 (1996) (63% of chemicals produced/ imported greater than one million pounds have not had basic carcinogenicity tests).

7. Since the overwhelming majority of published cases deal with causation, this will necessarily be the focus of this study. However, the few cases with regard to damages in toxic torts and land valuation provide an interesting juxtaposition to the causation cases.

8. Daubert v. Merrell Dow Pharmaceuticals, 509 U.S. 579, 113 S.Ct. 2786 (1993); General Electric v. Joiner, 118 S.Ct. 512 (1997).

9. Frye v. United States, 293 F. 1013, 1014 (D.C.Cir. 1923).

10. Paul C. Giannelli, The Admissibility of Novel Scientific Evidence: Frye v. United States, a Half Century Later, 80 Columbia Law Review 1197, 1221 (1980). Hereinafter "Giannelli."

11. See Roscoe Pound, Mechanical Jurisprudence, 8 Columbia L. Rev. 605 (1908); William Reynolds, Judicial Process, 53-60 (2nd ed.1991).

12. Giannelli at 1223.

13. People v. Kelly, 549 P.2d 1240, 1245 (Ca.1976) (conservative nature of admissibility under Frye warranted in context of scientific evidence which establishes guilt).

14. See, e.g. State v. Williams, 388 A.2d 500 (Me.1978); United States v. Williams 443 F.Supp. 269 (S.D.N.Y. 1977); United States v. Baller, 519 F.2d 463 (4th Cir. 1975); Reed v. Maryland, 391 A.2d 364 (Md. 1978). Each state and jurisdiction used a variety of methods ranging from Amodifying the Frye standard (Reed) to abandonment of the Frye standard and applying the newly created Rules of Evidence (Baller).

15. Michael H. Gottesman, From Barefoot to Daubert to Joiner: Triple Play or Double Error? 40 Ariz.L.Rev. 753, 756 (1998); Peter W. Huber, Galileo's Revenge: Junk Science in the Courtroom (1991).

16. Preliminary Draft of Proposed Amendments to the Federal Rules of Civil Procedure and the Federal Rules of Evidence, 137 F.R.D. 53, 73, 156 (1991). Jack Weinstein disagreed with the proposed amendment and questioned whether the skeptisism of judges regarding expert testimony resulted in a "poisoned environment" for any thoughtful change in the rule. Jack B. Weinstein, Rule 702 of the Federal Rules of Evidence is sound; it should not be amended, 138 F.R.D. 631, 633 (1991).

17. Neil A. Vidmar, Are Juries Competent to Decide Liability in Tort Cases Involving Scientific Issues? 43 Emory L.J. 885 (1994) and The Performance of the American Civil Jury: An Empirical Perspective, 40 Ariz.L.Rev. 849 (1998). Vidmar concludes that despite whithering criticism of jury abilities, there is no empirical support for the incompetent or overly-sympathetic jury as portrayed by critics. See Chaulk v. Volkswagen of Am. Inc., 808 F.2d 639, 644 (7th Cir. 1986) (Posner, J., dissenting) for criticism of venal experts who are nothing more than "paid advocates or partisans" that will testify to almost anything "not palpably absurd on its face."

18. Daubert, 509 U.S. at 587-595.

19. See Susan R. Poulter, Daubert and Scientific Evidence: Assessing Evidentiary Reliability in Toxic Tort Litigation, 1993 Utah L. Rev. 1307, 1309 (Daubert standard will be more flexible than Frye in toxic tort litigation); Jerry H. Elmon, 42 R.I.B.J. 13 (1993) (Daubert will allow more products liability

cases to survive summary judgment); Suzanne Orofino Galbato, Multiple Chemical Sensitivity: Does Daubert v. Merrell Dow Pharmaceuticals, Inc. warrant another look at Clinical Ecology? 48 Syracuse L. Rev. 261, 296-97 (1998) (Both Daubert and Frye exclude clinical ecologist testimony, but Daubert will allow future consideration of "shaky" evidence).

20. In generating the sample, I ran a Westlaw search of cases decided since 1994 in the Federal District Court and Appellate Court databases using the key words "expert testimony" in the same paragraph as "causation." For the state court search I added the additional qualifiers "product libaility" and "toxic!" to eliminate a vast number of unpertinent cases. From this body of case law, I then went through and used only toxic tort and product liability cases which ruled on the admission of expert testimony.

21. A similar sampling of cases from Daubert through October 11, 1995 found that expert testimony was excluded in 38 out of 60 circuit court cases. Through May 5, 1995, circuit courts excluded 29 experts out of a total of 45 cases. Lisa J. Agrimonti, Limitations of Daubert and its Misapplication to Quasi Scientific Experts, a two year case review of Daubert v. Merrell Dow Pharmaceuticals, 35 Washburn L.J. 134 (1995).

22. Lofgren v. Motorola, 1998 WL 299925 (Sup.Ct.Ariz. 1998) (Applied Frye test because expert used "scientific principles"); Blum v. Merrel Dow Pharmaceuticals, 705 A.2d 1314 (Pa. 1997) (Validity of expert evidence on "scientific matters" must be generally accepted).

23. 558 N.W.2d 319 (Ct.App.Neb. 1997)

24. Id.

25. See People v. Stoll, 783 P.2d 698 (Ca. 1989) (psychology is not "novel" and evidence of exculpatory diagnosis should have been admitted as relevant).

26. Berry v. CSX Transportation Inc., 709 So.2d 552 (Fla. 1998) (General acceptance of epidemiological method, not the opinion generated); United States v. McBride, 786 F.2d 45 (S.D.N.Y. 1986) (Psychiatry has gained general acceptance).

27. Lofgren v. Motorola, 1998 WL 299925 at 10-12 (Court finds no clear distinction between the general acceptance of the methodology and general acceptance of the conclusion; testimony inadmissible because there is no general acceptance linking chemical (TCE) to the disease in this case); McKenzie v. Westinghouse Inc., 674 A.2d 1167 (Pa. 1996) (Existence of causal relationship must be accepted, not methodology used to establish causal relationship).

28. See e.g. Blum v. Merrell Dow Pharmaceuticals, 705 A.2d 1314 (Pa. 1996) (Court requires that both causal relationship and underlying methodology must be generally accepted).

29. See Giannelli at 1211-1215; Christopherson v. Allied Signal, 939 F.2d 1106, 1111 (5th Cir. 1991). In Christopherson, the court asserts that the Frye test analyzes the methodology and the nature of the expert's conclusions are "generally irrelevant." However, the court decides that, though there is general acceptance that nickel cadmium fumes are associated with lung cancer, there is no general acceptance that such fumes are associated with colon cancer and therefore, the expert testimony is inadmissible. The court never analyzes whether the method of extrapolating one form of cancer to another is generally accepted.

30. Blum, 705 A.2d 1314 (Pa. 1997).

31. Id.

32. See Giannelli at 1215-1219. Giannelli cites three ways which courts determine general acceptance: (1) expert testimony; (2) scientific and legal literature; and (3) judicial opinions.

33. Berry v. CSX Transportation, 709 So.2d at 553

34. McKenzie v. Westinghouse, 674 A.2d at 1169 (small segment not enough); United States v. Torniero, 735 F.2d 725, 731-32 (D.Conn. 1984) (substantial acceptance is enough); Reed v. Maryland, 391 A.2d 364, 392-93 (Md. 1978).

35. Giannelli at 1197 (general acceptance assured if scientific community are those who have a stake in acceptance of theory or technique in question). Compare Commonwealth v. Lykus 327 N.E.2d 671, 678 (Mass. 1975) (general accpetance among those familiar with technique) with People v. Kelly, 549 P.2d 1240, 1250 (Cal. 1976) (voice spectography involves the scientific fields of anatomy, medicine, psychology, psychology phonetics and linguistics).

36. See e.g. Lofgren, 1998 WL 299925 at 8.

37. In People v. Kelly, the court notes the varying opinions regarding the admissibility of voice spectography under the Frye standard and the split within California on the issue. Kelly at 1245-46.

38. 223 So.2d 68 (Fla. 1968).

39. See e.g. Reed v. Maryland, 391 A.2d 364 (Md. 1978) (modified Frye); United States v. Williams, 443 F.Supp. 269 (S.D.N.Y. 1977) (Rules-based approach).

40. Reed 391 A.2d at 380.

41. In re Agent Orange Product Liability, 611 F.Supp. 1223 (E.D.N.Y. 1985).

42. United States v. Fosher, 590 F.2d 381 (1st Cir. 1979); United States v. Downing, 753 F.2d 1224 (E.D.Pa. 1985).

43. Downing 753 F.2d at 1230-1231.

44. Fosher, 590 F.2d at 383.

45. Daubert, 509 U.S. at 588.

46. Id. at 589.

47. Id. at 590.

48. Id. at 591.

49. See Daubert 509 U.S. at 598 (Rehnquist, C. J., dissenting) in part; Petitioners Brief, 1992 WL 541269 at 1.

50. Daubert, 509 U.S. at 595.

51. Jonier, 118 S.Ct. at 521 (Stevens, J. dissenting in part).

52. Id. at 519.

53. The Court does not make clear why reliability is linked with scientific validity. Daubert 509 U.S. at 599-600 (Rehnquist, C.J. dissenting in part). See also Robert F. Blomquist, The Dangers of General Observations on Expert Scientific Testimony: A Comment on Daubert v, Merrell Dow Pharmaceuticals, 82 Ky. L. J. 703, 710 (1994).

54. The judiciary's nearly unanimous rejection of animal studies in toxic tort cases is somewhat baffling considering the EPA routinely uses animal studies to determine safe levels of exposure. In fact, most of the data compiled by the EPA, as incomplete as it is (see supra, note 5), are animal studies. See U.S. EPA Guidelines for Carcinogen Risk Assessment, 51 FR 33992 (1986) (animal studies used for a variety of purposes including setting exposure levels).

55. 151 F.3d 269 (5th Cir. 1998).

56. The worker was ordered by the company to clean a spill of Toluene in a tractor trailer. After receiving the safety data on Toluene, the worker requested safety apparatus which the company refused, despite having such aparatus available. Id. at 280 (J. Dennis dissenting).

57. Id. at 272.

58. Id. at 278.

59. Id.

60. Id. at 279

61. Id. at 278, n. 10.

62. See, e.g. City of Greenville v. W.R. Grace, 827 F.2d 975, 980 (4th Cir. 1987).

63. Schudel v. General Electric Co., 120 F.3d 991 (9th Cir. 1997) (reliance on exposure levels different than plaintiff's exposure); In re Agent Orange, 611 F.Supp. 1223 (no reliable exposure evidence); Joiner, 118 S.Ct. at 518 (animal studies of mice exposure greater than plaintiff's exposure "so dissimilar" to facts of case that District Court did not abuse its discretion in excluding).

64. in re: Paoli Railyard Litigation (Paoli II), 35 F.3d 717 (E.D.Pa.) (allows expert reliance on animal data for general causation).

65. Keene Corp. v. Hall, 626 A.2d 997 (Md. 1993) (allow the use of reanalyzed asbestos epidemiological data to show general causation).

66. McCullock v. H.B. Fuller Co., 61 F.3d 1038 (2nd Cir. 1995); Golod v. Hoffman La Roche, 964 F.Supp. 841 (S.D.N.Y. 1997); Paoli II, 35 F.3d 717 (3rd Cir. 1994) (admit testimony of doctor who actually examined patients, exclude testimony regarding patients doctor did not examine);Rubanick v. Witco Chemical Corp., 593 A.2d 733 (N.J. 1991); Benedi v. McNeil-P.P.C., 66 F.3d 1378 (4th Cir. 1995).

67. See Moore v. Ashland Chemical Co., 151 F,3d 269 (5th Cir. 1998); Lofgren v. Motorola, 1998 WL 299925 (Ariz. 1998).

68. McCullock, 61 F.3d at 1044 (doctor relied on company safety data sheet for general causation); Paoli II, 35 F.3d at 734 (animal studies concluding PCBs a probable human carcinogen enough for general causation); Benedi, 66 F.3d at 1384 (Astudy of peer reviewed literature enough to satisfy general causation).

69. Kehoe Appeal, 648 A.2d 472 (N.H. 1994) (allow expert to testify to existence of multiple chemical sensitivity affliction and whether condition is work related); Cherico v. National Railroad, 758 F.Supp. 258 (E.D.Pa. 1991) (admit thermographic testing in Federal Employer Liability Act case even though mthod of diagnosis of dubious merit); McDaniel v. CSX Transportation, 955 S.W.2d 257 (Tenn. 1996).

70. Commerce Holding Corp. v. Assessors of the Town of Babylon, 649 N.Y.S.2d 932, 935 (N.Y.Ct.App. 1996).

71. Under CERCLA, 42 U.S.C. Sec. 9607(f)(1); Oil Pollution Act (OPA) 33 U.S.C. Sec. 2706(a) and (b).

72. United States v. 14.38 Acres of Land, 80 F.3d 1074, 1079 (N.D.Miss. 1996) (courts should proceed cautiosly in excluding land valuation testimony).

73. Iacobelli Construction Inc. v. County of Monroe, 32 F.3d 19 (2nd Cir. 1994) (Daubert does not apply to non-scientific experts); Watkins v. Telsmith Inc., 121 F.3d 984. 989 (5th, 7th, and 8th Circuits apply Daubert to engineering experts, 9th and 10th Circuits do not). Compare Bunt v. Altec Industries, 962 F.Supp. 313 (N.D.N.Y. 1997) (Daubert applies to engineering testimony); Jugle v. Volkswagen, 975 F.Supp. 576 (D.Vt. 1997) (Daubert does not apply to engineering expert).

74. The practice that the court will not adjudicate "abstract, hypothetical or contingent issues" is as neary as old as the Supreme Court itself. See Bernard Schwartz, A History of the Supreme Court, (1993).

75. Daubert, 509 U.S. at 582.

76. Daubert, Petitioner's Brief at 14.

77. Fed. R. Ev. 402.

78. Beech Aircraft Corp. v. Rainey, 488 U.S. 153, 169 (1988).

79. Huddleston v. U.S., 485 U.S. 681, 690-91 (1988) quoting Bourjaily v. United States, 483 U.S. 171, 179-80 (1987).

80. Gottesman, 40 Ariz. L. Rev. 753, 772-73.

81. See e.g. Clement v. Delgado Community College, 634 So.2d 412 (applied Daubert factors to tire expert and concluded expert's opinion was unreliable because his method was not subject to testing, he had not published his method, nor could an error rate be established).

82. See supra, n.73.

83. Supra, n. 73.

84. 1999 U.S. Lexis 2189.

85. Supra, n. 19.

86. 35 F.3d 717 (3rd Cir. 1994).

87. Id. at 746.

88. Daubert, 509 U.S. at 595.

89. Id. at 591.

90. Id.

91. Compton v. Subaru of America, 82 F.3d 1513 (10th Cir. 1996) (Daubert factors apply only to particular methodology or technique); Benedi v. McNeil P.P.C.Inc., 66 F.3d 1378 (4th Cir. 1995) (analyze the methodology of differential etiology, not the conclusion); but see Rosen v. Ciba Geigy Corp., 78 F.3d 316, 319 (7th Cir. 1996) (upholding exclusion of "bottom line" scientific testimony as unsupported by scientific data); Turpin v. Merrell Dow Pharmaceuticals, 959 F.2d 1349 (1992).

92. Joiner 118 S.Ct. at 519.

93. BMW of North America Inc. v. Gore, 517 U.S. 559 (1996) (requiring judges to review size of punitive damage awards); Markman v. Westview Instruments Inc., 517 U.S. 370 (1996) (judge better suited to interpret terms of patent). See also Michael H. Gottesman, From Barefoot to Daubert to Joiner: Triple Play or Double Error, 40 Ariz. L. Rev. 753, 759-61 (1998).

94. Rules of the Supreme Court, Rule 10.

95. Id. Rule 10(a).

96. See Daubert, 509 U.S. at 587 n. 5.

97. Compare the approaches of the Second and Fifth Circuits: Iacobelli Construction v. County of Monroe, 32 F.3d 19, 24 (2nd Cir.1994) (overturned lower court's exclusion of expert affidavits based on trial court application of Daubert and finding that experts' attempt to supplant conclusion of trial judge regarding terms of construction contract); Moore v. Ashland Chemical, 151 F.3d 269 (5th Cir. 1998) (upholds trial judge exclusion based on conclusion of expert, found "analyticial gap" between data and conclusion). See *supra* notes 65 through 68 noting the difference in circuits' analysis of diagnosis causation.

98. Kumho Tire Co. v.Charmichael, 1999 U.S. Lexis 2189 at 21, 25-26 (1999).

99. Joiner 118 S.Ct. at 520.

100. 463 U.S. 880 (1983) (reliability to be determined in the adversary process).