Addressing Scientific Abuses in the Courtroom

(Session: "Ethics of Baseless and Scientific Misconduct")

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The Folly of Junk Science

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When the disciplines of forensic science, medicine, toxicology, epidemiology, or other scientific matters are involved in legal cases, lawyers often rely on expert witnesses to persuade the courts and juries that the relevant science supports their testimony. Unfortunately, in some cases, expert witnesses provide testimony that is not based on reliable or robust scientific principles and methods, and they may introduce scientific bias and/or "junk science" into the proceedings.

A recent example of flawed scientific testimony in the courtroom resulted in the removal of verdicts totaling $117 million over claims that Johnson & Johnson's talcum powder products contained "asbestos" and caused a man's mesothelioma.[1] The New Jersey appeals court found that the plaintiff's experts' improper testimony that non-asbestiform minerals could cause mesothelioma warranted new trials.[2]

Almost 30 years ago, the Supreme Court decided the seminal case concerning the use of science in modern courtrooms, *Daubert v. Merrell Dow Pharmaceuticals*, in which the Court addressed widespread concerns that courts were admitting unreliable evidence.[3] The Supreme Court in Daubert held that testimony should be classified as scientific and, thus, presented through expert testimony, only if a judge first determines that the proffered testimony consists of inferences and assertions "derived by the scientific method."[4] Daubert and two subsequent Supreme Court cases[5] established the doctrine, codified in Federal Rule of Evidence 702, that to be admissible in federal courts, expert testimony must be based on principles and methods that are both relevant and reliable.[6]

Today, the FRE guides decision-making on the admissibility of scientific evidence and declares that a trial court should consider whether the expert is proposing to testify to scientific knowledge that will assist the trier of fact to understand or determine a disputed fact issue.[7] The admissibility of scientific evidence in trial court is determined by the judge. While most states have now incorporated Daubert's expert testimony admissibility standards into their own

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[1] Wichert, B. April 28, 2021. J&J, Imerys Beat $117M Talc Verdicts Over Flawed Testimony. Law 360. Available at: https://www.law360.com/articles/1379568/j-j-imerys-beat-117m-talc-verdicts-over-flawed-testimony.
[2] Ibid.
[3] *Daubert v. Merrell Dow Pharms*., 509 U.S. 579 (1993).
[4] Ibid.
[5] *General Electric v. Joiner*, 522 U.S. 136 (1997) and *Kumho Tire Co. v. Carmichael*, 526 U.S. 137 (1999).
[6] Federal Rules of Evidence, 2021. Available at: https://www.rulesofevidence.org/.
[7] Ramsey, J. 2018. Why do we still use "junk science" to convict? Blame the judges. The Crime Report. Available at: https://thecrimereport.org/2018/08/01/why-do-we-still-use-junk-science-to-convict-blame-the-judges/.

evidentiary rules and/or case law, some trial judges still disregard their "gatekeeper" role and allow juries to hear expert testimony that is scientifically unreliable. This has led to unfair verdicts, unwarranted damages awards, and denied defendants' rights to due process of law.

Some states have taken steps to address scientific misconduct or bias in the legal system. For example, the Texas legislature established the Texas Forensic Science Commission with the intention to "investigate complaints involving forensic disciplines," to "establish procedures, policies, and practices to improve the quality of forensic analyses conducted in Texas," and "to establish licensing programs for forensic disciplines."[8] The Commission comprises seven independent scientists and two attorneys, a prosecutor and a defense lawyer, who are unpaid and make nonbinding recommendations on forensic matters. They can hear from experts in an area, review studies, and collaborate with professionals in the justice system to improve education and training in forensic science and the law.[9]

There are also many societies and organizations that have developed guidelines, policies, or a Code of Ethics to address scientific integrity in a variety of scientific fields. For example, the Society of Forensic Toxicologists has a Code of Ethics to which members must agree. These obligations include: 1) Perform professional activities with honesty, integrity and objectivity; 2) Refrain from knowingly misrepresenting professional qualifications including, but not limited to: education, training, experience, certification, area of expertise, and professional memberships; 3) Hold in confidence and refrain from misuse of information obtained or received in the course of professional activities; 4) Provide expert advice and opinions within the limits of individual competence and generally accepted scientific principles; 5) Render testimony in a truthful manner without bias or misrepresentation; and 6) Refrain from exercising professional or personal conduct adverse to the best interests and objectives of the Society.[10]

The National Academy of Science (NAS)[11] and President's Council of Advisors on Science and Technology ("PCAST") [12] reviewed whether forensic evidence, such as DNA testing and bite mark analysis, are supported by reproducible research and, thus, are reliable. Both concluded that there is much forensic evidence that is insufficiently tested for validity and reliability. The PCAST Report stated, "[m]uch forensic evidence—including, for example, bite marks and firearm and toolmark identifications—is introduced in criminal trials without any

[8] Ibid.
[9] Texas Forensic Science Commission. Available at: https://www.txcourts.gov/fsc /.
[10] Society of Forensic Toxicologists, Inc., Guiding Principles of Professional Responsibility. Available at: https://www.soft-tox.org/ethics.
[11] National Academy of Sciences (NAS). 2009. Strengthening Forensic Science in the United States: A Path Forward. Available at: https://www.nap.edu/catalog/12589/strengthening-forensic-science-in-the-united-states-a-path-forward.
[12] President's Council of Advisors on Science and Technology PCAST Report -- Forensic Science in Criminal Courts: Ensuring Scientific Validity of Feature Comparison Methods. 2016. Available at: http://www.ncstl.org/resources/PCAST.

meaningful scientific validation, determination of error rates, or reliability testing to explain the limits of the discipline." NAS stated, "[t]he bottom line is simple: In a number of forensic science disciplines, forensic science professionals have yet to establish either the validity of their approach or the accuracy of their conclusions, and the courts have been utterly ineffective in addressing this problem."

Moreover, the World Association of Medical Editors, which consist of editors of peer-reviewed medical journals from countries throughout the world, seeks to foster international cooperation to implement guidelines regarding standardization of publication practices. The goal of the organization is to encourage research into the quality and credibility of peer review and scientific publications and to establish the evidence base on which scientists can improve the conduct, reporting, and dissemination of scientific research. Such associations are critical because scientific experts typically rely on published peer-reviewed studies and literature to support their opinions and conclusions. With the increasing number of on-line journals and non-peer-reviewed scientific literature being published on the internet, there will need to be an increased vigilance and evaluation of the testifying scientific expert's opinions and purported supporting literature.

Something Wicked This Way Comes
A Practical Guide to Combating Abuse and Misuse of Scientific Data
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Introduction

Nothing causes greater anxiety or fear in a plaintiff than being told he or she is at increased risk of contracting or has contracted cancer because of an exposure to a toxic substance. No litigation strikes a greater emotional chord with a jury than a plaintiff exposed to chemicals or substances (e.g., asbestos fibers) in an industrial setting or as the result of environmental contamination through no fault of their own. The litigation that inevitably ensues is complicated by the fact that the exposure, or exposures at issue, may have taken place years or decades ago to a substance or substances, the toxicity of which is unknown or only marginally investigated. Adding to the complexity is the fact that the plaintiff's injuries may also be of a type that is found in unexposed populations.

Causation is the central issue in these cases and scientific evidence required to prove causation may be uncertain, non-existent, inconclusive or demonstrates only an association. In many cases, the injury is preceded a latency period that may be decades in length which makes identifying the chemical that caused the injury difficult because of conflicting or dim memories of working conditions, or the fact the plaintiff may have been exposed to additional chemicals during the latency period. Complicating this litigation even further is the nature of the evidence required to prove a plaintiff's claim; it spans a wide spectrum of medical and scientific disciplines including epidemiology, risk assessment, pharmacology, analytical chemistry, toxicology, oncology, and genetic research to name but a few.

Toxic tort litigation began in earnest in the mid-1970s with the onset of the asbestos cases. Over the last 45 years, it has become clear that the penultimate question in any toxic tort case is causation--in essence did the exposure to the particular chemical or substance led to plaintiff's disease process. The question of causation, and what evidence can be admitted proving it, has been the stuff of legions of opinions by state and federal judges. Currently, American industry utilizes roughly 65,000 chemicals, of which only 1,500 have been identified as neurotoxins and several dozen as carcinogens. While many chemicals have a well-developed data base consisting of toxicological and epidemiological, *in vitro* investigations and pharmacologic analyses, globalization and more sophisticated manufacturing techniques have produced new compounds and substances whose data base consists of possibly confidential information submitted to regulatory agencies (if required), or what was developed by internal research and not usually available to the public or published in peer-reviewed scientific literature.

The collision between law and science is most clearly evident when courts pursue the causation question. In the context of toxic tort litigation, the law has consistently sought certainty and has constantly looked for a bright line test to

define causation, while science emphasizes a more inclusive approach, and tends to blur the bright lines the law seeks. Over the years, this collision has evolved into two distinct approaches as to how causation data is presented to a jury. On the federal level, a framework for assessing the admissibility of causation data was defined by *Daubert v. Merrell Dow Pharmaceuticals, Inc* 509 U.S. 579 (1993), *General Electric v. Joiner*, 522 U.S. 136 (1997) and *Kumho Tire Co. v. Carmichael*, 526 U.S. 137 (1999). However, whether a state court judge will apply this framework as strictly as the federal courts is problematic, consequently the potential for abuse of the data and ethical breaches at the state level is much greater.

Proving Causation

As a general rule, plaintiff's counsel wants the data viewed *in toto*, arguing the "weight of the evidence" approach means exactly that--judicial consideration of all the evidence (studies) in order to properly assess the causation question. The defense typically argues that the weight of the evidence approach gives rise to data being admitted that would otherwise be excluded and urges that each study be analyzed separately in order to determine its reliability and admissibility. This affords the defense the opportunity to present arguments as to why *in vitro* analyses, toxicological studies, case reports, or other anecdotal data are not appropriate platforms to predict causation in humans.

Proof of causation is a two-step process in every toxic tort case. The plaintiff's counsel is tasked with proving general causation or is the chemical in question capable of causing the type of injury claimed by the plaintiff. General causation is typically proven by epidemiological studies demonstrating an increased incidence of morbidity or mortality in populations exposed for particular periods of time. Once general causation is established, plaintiff's counsel must then prove specific causation, or did the chemical in question cause this plaintiff's particular injury. Typically, counsel seeks to prove specific causation through the introduction of toxicological studies, *in vitro* analyses, pharmacological comparisons, case reports and other anecdotal data. This approach is almost always contested by the defense in pre-trial hearings, and it is here where the "battle of the experts" is either won or lost.

Experts have at their disposal various types of data to rely upon in support of their opinions regarding causation in toxic tort or chemical injury cases. In order to understand how these data can be abused, it is helpful to have an understanding of each type of study or analysis.

1. Epidemiology studies are usually classified as cohort or prospective studies where researchers identify a population and study it over time to assess the incidence and prevalence of disease. Case control or retrospective studies occur where researchers identify a population through a review of death certificates and compare the incidence of disease in a particular population over a defined period of time. Other

studies such as cross-sectional measure the prevalence of health outcomes or determinants of health, or both, in a population at a point in time or over a short period of time. In determining whether an epidemiology study is admissible to show causation, some federal courts have concluded that the study must demonstrate a relative risk ratio (exposed population compared with a control group) of 2.0 or greater with a 95% confidence level (meaning there is only a 5% possibility that the observed effect is due to chance). Having a relative risk ratio of at least 2.0 means there is a 50% possibility that the observed effect is due to the exposure to the chemical. As will be discussed later, this bright line is being blurred in a number of state court decisions as well as by Comment C to the Restatement 3rd of Torts.

2. Case studies have a limited probative value because they are an observational report of an adverse effect or disease in humans. While they describe adverse effects or disease involving one or a few individuals and, on occasion, attempt to describe the exposure or mechanism of action, standing alone, they are the weakest support for causation. Case reports cannot make any kind of comparison with the rate at which the observed effect may occurs in the general population. In addition, there is typically little or no data regarding exposure levels in case reports, so it is not possible to draw reliable conclusions regarding causation. In essence, they consist of anecdotal evidence without reference to a control group.

3. *In vivo* or toxicological studies involve animal populations exposed to potentially high doses of a chemical in order to study the effect in that group. While informative, toxicological studies suffer from several drawbacks when using them to determine causation. Most importantly, in many studies, the animals are exposed to doses far higher than what human populations experience. One of the purposes behind the use of toxicological studies is to generate data to establish a dose-response curve (a relationship in which a change in the amount, intensity, or duration of exposure to a chemical is associated with an adverse effect that may either increase or decrease the risk of disease). Data from the dose-response curve is used to extrapolate the results observed in the animals across species to what should be expected in humans through the use of statistical models. This can be highly questionable for some chemicals, given the physiological and metabolic differences between the test animals and humans, and what can be expected in terms of adverse effects that may be caused by the much lower exposures typically experienced by humans. Further, in many cases, toxicological testing is conducted at high exposures to induce effects with strains of animals that have been bred to produce reactions in test settings. Generally, this type of testing is seen in the regulatory arena involving product registration with federal agencies.

4. *In vitro* studies consist of exposing cells, bacteria, tissues, or organs to chemical substances to observe biochemical effects. Their

probative value is questionable based on the inferential leap required to apply isolated tissue or cellular results to whole human beings.

5. A "differential diagnosis" (an often misused term—it is more accurately a "differential etiology") is a process wherein the expert claims to consider multiple potential causes of the plaintiff's disease process, ruling out those the expert concludes are unlikely, and ultimately concluding the remaining cause is the probable explanation for plaintiff's injury.

Federal Approaches to Causation

A review of published opinions on the federal and state level suggests there are two increasingly divergent lines of thinking with respect to the general causation question. Federal courts have largely stuck to the traditional approach, espoused by Daubert and its progeny, concluding that the best evidence is that which fits a two-prong test-is the evidence relevant or, in other words, does it fit the exposure regimen and disease process, and is it reliable, or does it comport with the criteria established by Daubert and its progeny. An example of such evidence is the federal courts insistence of establishing a bright line concluding well designed epidemiological studies finding a relative risk of 2.0 or greater, with a 95% confidence factor are the best evidence of causation. In answering questions concerning the relevance and reliability of causation evidence, Federal courts have demonstrated a sensitivity about crossing the line between judging the soundness of the methodology as opposed to evaluating the results produced, normally the province of the jury.

However, recent years have witnessed a growing trend in the federal setting that the absence of epidemiology studies is not fatal to establishing causation. In cases where no epidemiology exists, a number of federal courts have permitted counsel to introduce evidence concerning the dose-response relationship of the substance in question. These courts have also permitted the introduction of evidence demonstrating what the background risk (the chance of someone acquiring the disease without exposure to the chemical in dispute) is and comparing it to the additional risk (that increase in the risk of disease resulting from exposure to the chemical) experienced by the plaintiff. As a general rule, federal courts have not permitted the introduction of in vitro and toxicological studies when offered alone as proof of general causation but will permit the use of animal data to provide support for the interpretation of human epidemiology or clinical data.

State Approaches to Causation

State courts, depending on the jurisdiction, tend to take a more lenient approach, permitting the introduction of evidence typically excluded by federal courts, in essence, adopting a "weight of the evidence" approach wherein all available data is admitted for purpose of determining causation. State court judges tend to take a

liberal view of admissibility and are more accepting of the weight of the evidence argument. It is not uncommon in cases which are solely dependent upon animal and anecdotal data for the court to admit this evidence, rationalizing that when registering products with the appropriate federal agency, companies are required to submit evidence of intensive testing-evidence that encompasses animal studies and may include studies with human subjects. This approach is generally employed when there is an absence of epidemiological data and, it is argued, is more in keeping with science which looks at all options presented by all the available studies and data.

The publication in 2010 of Comment C to the Restatement 3rd of Torts suggests the more lenient approach may be gaining greater acceptance. Comment C laid the foundation for a major change in how evidence in toxic tort litigation would be evaluated. In doing so, the comment addressed the conflict between the reasonable degree of scientific or medical certainty and the reasonable degree of scientific or medical probability. It opened the door for plaintiff's counsel to argue that a reasonable degree of scientific or medical probability was just another way of saying preponderance of the evidence and that reasonable degree of scientific or medical certainty called for an evidentiary showing that was greater than the preponderance of the evidence.

In addition, the comment argues that, with respect to general causation, it is no longer necessary to show the increase in relative risk, as expressed in epidemiological findings, needs to be 2 or greater in order for plaintiff to meet the burden of proof. So long as there is adequate evidence of general causation, the plaintiff should be permitted to argue the disease was more likely than not caused by the exposure. Adequate evidence could include a differential diagnosis, data about the mechanism of action for the chemical and its association with adverse effects, and a reasonable explanation of why there is an absence of general causation information. While the comment finds that case reports are generally insufficient to show general causation, it does suggest that where there are repeated case reports addressing a powerful agent with a disease comparable to plaintiff's injury, such reports should be admitted.

Abuses of Data

In light of what appears to be a shift away from the bright line approach for establishing causation espoused by federal courts in Daubert and its progeny, the potential for experts, tasked with proving general and special causation, to misuse and abuse the data they rely upon increases substantially. The following are examples of how an expert may misuse or manipulate data:

1. **Epidemiological Re-analysis**

Epidemiological re-analysis occurs when the expert, as opposed to the original investigator, purports to obtain or interpret the original data and conducts their own analysis to evaluate its quality. The re-analysis may involve modifying

conclusions reached in the original study based on what the reviewing expert views as incorrect assumptions, improper techniques. study design issues or problematic results. This approach is usually undertaken where the available epidemiology studies do not demonstrate an association between the type of harm suffered by the plaintiff and exposure to the substance at issue. This can be combated by the defense demanding a methodological explanation-in short, a detailed analysis by the expert as to what is wrong with each of the studies. Accompanying this attack should be an investigation to see if the expert's re-analysis has been peer-reviewed, published in a reputable journey or was prepared solely for purposes of the litigation.

2. **Consolidation of Cases with Multiple Injuries and Multiple Exposures**

Plaintiffs often argue that the court should consolidate multiple individual cases (assuming a limited number) or groups of cases for trial as a matter of expediency, judicial efficiency, and cost. Such consolidation will almost always involve cases with plaintiffs who have multiple types of tumors at multiple organ sites, arguing that a single substance/compound is the causative agent. Research has demonstrated that most carcinogens are site specific, and an agent that can cause cancer in multiple organ systems is a relatively rare occurrence. Moreover, the plaintiffs present with a spectrum of exposures ranging from minor to substantial contact with the chemical, and in many instances, additional substances with known and unknown toxicities. Again, carcinogens develop tumors at certain levels of exposure over certain lengths of time commonly referred to as the latency period. Plaintiffs' causation argument fairs better where there are site specific injuries compatible with epidemiological data or clinical data, exposure scenarios paralleling the exposure data in epidemiological studies (if available), data from toxicological studies, and a mechanism of action that has medical and scientific support.

3. **The Expert Cherry Picks the Data to Support the Conclusion**

It is not unusual for a some experts to cherry pick the available data to support the conclusions that form the crux of the causation opinion rendered by the expert witness. The expert may select only certain studies and/or data to rely upon in expressing a causation opinion, while systematically ignoring or down-playing other studies that fail to show a connection between exposure to the chemical in question and the disease process alleged by the plaintiff. The expert's opinion can be undermined, and his/her bias revealed by a detailed examination as to why the expert chose to rely on certain studies while failing to consider other studies that demonstrate a lack of causal association.

4. **Use of Toxicological Data**

The expert will argue that toxicological studies should be admitted, especially where any epidemiological data is absent, because toxicological studies are routinely relied upon by regulatory agencies in the registration process for certain

products (e.g., pesticides). Strong arguments can be made that the agencies are engaged in a regulatory process geared to the protection of public health resulting in the promulgation of exposure standards and protective recommendations for the general public. The agencies are interested in the spectrum of effects that may result from various levels of exposure, particularly at the anticipated human exposure levels. Again, this analysis is designed to provide the agencies with sufficient data to set exposure standards; consequently, it is inappropriate for a court to permit that same process to be used in an effort to prove causation in an individual plaintiff.

5. Toxicological Data and Protocols

Plaintiff's counsel argues that causation can be proved by toxicological data that has been conducted by a protocol where there is no agreed upon standard to test the results and the methodology is not widely accepted in the scientific or medical community.

6. Differential Diagnosis and Differential Etiology

A differential diagnosis (also known as differential etiology) is essentially a process of elimination wherein the expert establishes a cadre of all known or suspected explanations for plaintiff's illness and then eliminates them one-by-one based on the data the expert has reviewed. Eventually he/she is left with one (hopefully) explanation. This process is generally excluded unless the expert can demonstrate there is independent, reliable evidence supporting a "ruling in" of the remaining cause. This process is inherently subject to selection bias by the expert as to the data he or she chooses in support of their conclusion as to what substance caused the plaintiff's illness. Absent studies and data supporting the conclusion that the substance in question is capable of causing plaintiff's injury, a differential diagnosis ought not be admissible even if the expert can rule out all other alternative explanations for plaintiff's medical condition other than the substance being litigated.

7. Combining Evidence Obtained from Unreliable Methodologies

The expert reaches a causation opinion by consolidating a variety of methodologies, none of which, standing independently, would be deemed reliable by the court. However, the expert claims that when considered *in toto*, the combined studies are reliable proof of general causation. This methodology can also be considered the "weight of the evidence" approach that the expert will contend is in keeping with the application of the scientific method. While it is true the scientific method recognizes that untested assessments may signal that further study on causation is warranted and suggest the direction of that study, the method does not recognize the weight of the evidence reasoning as determinative of the question as to whether causation exists.

Conclusion

The successful defense of a toxic tort case rests on a detailed analysis of all the data that the plaintiff's experts have relied upon to determine whether the data will withstand strict scientific scrutiny. Appropriate motions *in limine* applying the law as defined by Daubert and its progeny should be filed seeking to exclude those data and studies that fail to meet appropriate scientific rigor. Counsel should expect substantially greater success on the federal level in excluding questionable data. Success on the state level will most often depend on counsel's ability, and the court's willingness, to analyze the individual studies and data presented by the plaintiff's expert and consider the various short comings in each.

Challenging the Admissibility of Expert Opinions at Trial

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Vince Lombardi, the legendary Green Bay Packers coach of the 1960s, said that "[f]ootball is blocking and tackling. You do that better than your opponent, you win." In other words, it's all about executing the fundamentals.

So, too, in dealing with scientific experts in modern toxic tort and environmental litigation. Indeed, appropriate challenges to the admissibility of the expert's opinions at trial can mean the difference between a plaintiff or defense verdict.

We thus think it wise – as Coach Lombardi reminds us – to focus on the basics to which due consideration should be given in contesting expert testimony.

I. What is Expert Testimony?

Broadly stated, "expert testimony" pertains to a **subject** which is **sufficiently beyond common experience**, such that the expression of that testimony, and any attendant opinions, would **assist the jury** in resolving one or more disputed fact issues submitted for its determination. Such testimony and opinions must be based on matters **perceived by** or **personally known** to the witness (whether by virtue of their own education, training and experience, or on matters and materials provided to them in the litigation). Moreover, those matters must be of a type that **reasonably may be relied** upon by expert **in the field**, **on the specific subject** to which the witness's testimony pertains (unless precluded by law).

Accordingly, expert testimony is typically required when proof of a claim or defense calls for evidence **beyond** the ordinary person's common knowledge. In other words, the testimony of an expert is compelled when the subject of that testimony is not something that the ordinary juror would know, or understand, based on everyday experience.

Expert testimony may be permissible, even if the lay jurors may have some knowledge concerning the issues, if it would be **helpful** in assisting the jury resolve a disputed issue. Thus, even if ordinary persons might have a general lay understanding of the issue, an expert's opinion may still be useful where it can help the jury better, or more clearly, understand the facts and circumstances presented in the case.

By contrast, expert testimony should be prohibited in specific circumstances. For example, **issues of law** (e.g., the existence of a "duty," "obligation," "moral imperative") is not a proper subject for expert testimony because it invades the province of the court and does not concern a disputed fact issue. Subjects for which there is **no recognized expertise** should also be off limits. A recent tactic of the plaintiff bar and their experts is to opine on the existence of a "conspiracy" among defendants and others to engage in bad conduct. But there is no generally accepted or recognized expertise on the "existence of a conspiracy," and such testimony should be barred.

Moreover, **matters of common experience, knowledge or interpretation** should not be the subject of expert testimony. As Bob Dylan notes, "you don't need a weatherman to know which way the wind blows." If the subject of the proffered testimony is within the lay understanding of the jury and would not otherwise be objectively helpful in assisting the jurors perform their task, a court is well within its discretion to exclude that testimony.

II. The 10 Goals of the Expert Deposition

Since there is a "top 10" list for virtually everything, we provide here our 10 goals of the plaintiff expert deposition with an eye towards challenging the opinion at trial.

1. Learn the Opinions

The most obvious goal of any expert deposition is to identify and understand fully each and every opinion the expert intends to express at trial. It is surprising how often certain opinions, or sub-opinions, are either concealed, ignored, or not thoroughly pursued. It is critically important that each opinion be articulated, required to be expressed as fulsomely as possible, and any sub- or associated opinions identified and explored.

At the end of the deposition, the classic close-off questions should be posed: "Have you now identified for us all of the opinions that you intend to express to the jury at the time of trial? Are there any other opinions, or areas of testimony, that you intend to offer at trial that we have not fully discussed? Is there any further work you intend to do in this case before testifying at trial?" At the very least, this will provide defense counsel with strong arguments to exclude any new, different or modified opinions at trial.

2. Understand the Bases for the Opinion

It is equally important to understand the grounds for and materials on which each opinion is based. Potential motion challenges to admissibility will rest heavily on what the expert claims she relies on in arriving at her opinion.

Since an expert's opinion is notionally based on education, training, experience, and matters known to or made available to the expert, each potential category should be identified and explained. This is particularly true where the expert is reluctant or unable to identify authoritative and reliable literature supporting the opinion, thereby suggesting it is the mere "*ipse dixit*" of the expert which is the basis for the opinion (the so-called "authority-based" as opposed to "evidence-based" opinion).

3. Pin Down the Witness

The deposition is the best place to test the credibility and reliability of the plaintiff expert's opinion because it enables defense counsel to ask probing and specific

questions which the expert may be unable or not want to answer. Since there is no judge to tell you to "move along, counsel," one has the opportunity to ask, and repeat, questions until one gets a proper and complete answer.

4. Lay Cross-Examination Groundwork

By getting the expert to commit to the specific opinions in her testimony, and potentially narrowing the scope of that testimony, defense counsel will be better able to prepare for cross-examination at trial. At the same time, the deposition can be used to determine whether plaintiffs' expert may be willing to adopt certain facts favorable to the defense, notably including acknowledgment of and support for certain opinions held by the defense experts.

5. Explore Qualifications

What makes this person an "expert" whose testimony and opinions are necessary or helpful to the jury in resolving a disputed fact issue? Does this expert truly and objectively possess the necessary education, training, and experience in the field, and on the subject, to which his testimony pertains? Indeed, just because one has an "M.D." after her name does not entitle that physician to render opinions or any subject in medicine which suits her fancy.

At bottom, it is important to ferret out precisely what the expert has done in the real world on the issues encompassed by the testimony. Anyone can read the literature and spout back what they read (i.e., serve as a conduit for hearsay). By that standard, an attorney would be equally competent in rendering expert testimony at trial. Thus, probing questions should be asked to determine what gives this individual the *gravitas* to render opinions on the subject to which he is testifying.

6. Demonstrate Bias

Bias and prejudice can run equally deep on both sides of the ledger, but it is nonetheless important to fully assess those facts and circumstances which readily demonstrate the bias of a plaintiff expert. For example, does the expert only consult and testify for plaintiffs and their attorneys, or has she ever worked for companies, whether or not sued in civil litigation. What percentage of the expert's income is due to consulting and testifying for plaintiffs in litigation, and how have the expert's fees increased over the course of time? Has the expert ever arrived at an opinion or conclusion exonerating a company, or a product, in a case in which he was consulting or testifying for plaintiffs? Has the expert ignored critical contrary data tending to discount or impugn her opinion? These subjects are worthy of careful examination.

7. Explore Lack of Support

As essential as identifying all stated bases for the opinion is to identify inconsistencies in the data and a general lack of objective support for the opinion.

One can go a long way towards undermining the credibility of an opinion, if not barring the opinion at trial, by demonstrating that it is not based on well-established and generally accepted principles, is contradicted or rejected by an impressive and robust literature, or that the expert has simply engaged in sophistry by arriving at an opinion by "cherry-picking" the data in "considering and ruling out" other potential (if not more likely) explanations or causes.

8. **Identify Weaknesses in Plaintiff's Case**

Since plaintiffs' claims may largely rise or fall on the strength of their expert's testimony, it is important to use the deposition as an opportunity to identify and exploit holes and weaknesses in the case. In particular, it is necessary to determine whether the record evidence actually supports the opinion, or whatever assumptions the expert is making in arriving at that opinion. It is also critical to determine what information is absent from the record evidence which, if known, would tend to refute the opinion.

9. **Evaluate the Witness**

The face-to-face deposition is an ideal opportunity to assess the demeanor and appearance of the witness and determine how he or she will "play" in front of the jury. Even otherwise legitimate experts are sometimes too smart and glib for their own good, and that hubris may work against them in trial. By the same token, an expert may be so self-effacing, calm, deliberate, and (heaven forbid) nice that jurors will want to listen to them all day. It is necessary to take these issues into one's calculus in evaluating how the trial will play out.

10. **Develop Motions to Exclude**

Motion *in limine* practice is one of the less-well contemplated and executed mechanisms of trial practice. This is unfortunate because, properly handled, concise and laser-like motions to exclude plaintiff expert testimony can be extraordinary effective. Even if the expert's testimony is not excluded or limited at the time the motion is heard, it can serve to educate the judge, and thereby heighten the court's attentiveness to the issue when the expert testifies before the jury. Indeed, many trial judges' default to denial of *in limine* motions, without prejudice, subject to seeing and hearing the actual evidence.

III. **Grounds to Exclude Opinion Testimony**

Regardless of the name put on it (e.g., *Daubert, Havner, Sargon, Frye* or Federal Rule of Evidence/state evidence code challenge), all courts provide for pre-trial and other hearings outside the jury's presence in order to consider the foundation for and admissibility of expert opinion testimony. In his outstanding note on the subject, Texas Appellate Court Justice Harvey Brown (then sitting as a trial court judge) wrote about the so-called "Eight Gates of Expert Testimony" through which each opinion must (or should) pass before being admitted. [*See*, 36 Hous. L. Rev. 743.]

1. **Relevance**

It is hornbook law that only relevant evidence is admissible. Evidence is relevant only if it is probative of some disputed fact issue which must be decided by the jury. This triggers the issue of whether expert opinion testimony is required, helpful, or prohibited under the circumstances, and whether each particular opinion is actually and ultimately useful to the jury in resolving the issues they must decide.

2. **Qualifications**

Discussed at length above, it is enough to say here that the expert should be tested on his true education, experience, training and accomplishments in the field, and on the precise subject to which his testimony pertains. This cannot be taken for granted merely because the expert has an impressive and lengthy curriculum vitae and bibliography. If the expert has really not done anything of significance in the area on which he now seeks to testify, his "real" qualifications to render opinions on the subject should be challenged.

3. **Assist the Trier of Fact**

The admissibility of opinion testimony depends on whether it is proper, helpful, and reliable. Only then can the opinion truly "assist" the jury in resolving disputed fact issues. Each of these criteria must, in turn, be assessed - - does the opinion embrace the subject which is a proper area for expert testimony; will it assist the jury; and is it itself reliable or based on reliable materials of the type that an expert in the field typically relies on with respect to the issues.

4. **Methodologic Soundness**

It is extraordinary how often some experts simply abandon the routine and accepted principles of science, medicine, engineering, or other disciplines in the context of litigation. In other words, they do things, or fail to do things, that they would never do, or fail to do, in the day-to-day practice of their profession. The notion that an opinion is proper if it is couched in terms of "more likely than not" is used as an excuse for abandoning rigorous and proper analysis. This is no small matter, and one's defense experts may be the best resource in attacking the methodologic flaws, errors and oversights committed by plaintiffs' experts.

5. **Proper Extrapolation**

At bottom, the question is whether the claimed basis for an opinion actually supports that opinion. An expert may testify that "studies A, B and C support my opinion," but careful analysis of those studies may reveal that they say something quite different, notably including the study authors' own conclusions which wholly contradict the expert's testimony. This is why it is so important to evaluate every cited basis for an expert opinion(s) in order to determine whether it actually supports the expert's opinion(s).

6. **Reliable Data** and **Data of the Type**

It used to be said in jest that "an expert can rely on anything, including the Holy Bible and Betty Crocker Cookbook, in support of an opinion," and the crucible of cross-examination can be used to test that foundation. No more. It is now well-established that an expert opinion must be predicated on a reliable foundation and proper assumptions - - *i.e*., materials on which a reasonably objective expert in the field would consider and rely in arriving at an opinion upon the subject. Thus, inquiry should be made into, and challenges brought, where the expert is relying on weak or discredited data where stronger and more authoritative and accepted literature and other materials are available.

7. **The Catch-All**

As with all evidence, one must give careful consideration to a challenge based on the expert opinion being unduly prejudicial, misleading, time-consuming, or cumulative. Indeed, even if the expert's opinion can pass through the first seven gates, grounds to exclude may still lie. It is thus necessary to treat such arguments seriously, and not simply as boilerplate in the brief.

Strong arguments may exist to exclude an otherwise relevant and admissible opinion based on the fact that another expert is already testifying on the point; that the opinion, as expressed, would be (unduly) misleading and confusing to the jury; that the expression of the opinion and its bases would take too much time in light of its importance to the case; or that the opinion would, indeed, be *unduly* prejudicial to the defense because of the manner in which it is expressed, or the subject to which it relates.

IV. **Conclusion**

There is simply no reason to give experts a free pass and wait for cross-examination at trial to explore the weaknesses and fallacies in their testimony. We trust these thoughts provide our colleagues with ammunition to plan for future expert depositions and opinion challenges at trial. These proceedings are the main events in toxic tort and environmental litigation, and should be considered in that light.