Life After Daubert v. Merrell Dow: Maine as a Case Law Laboratory for Evidence Rule 702 Without Frye

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I. THE POINT IN CONFLICT:
ADMISSIBILITY OF EXPERT SCIENTIFIC TESTIMONY

In reaching its recent decision in Daubert v. Merrell Dow Pharmaceuticals, Inc.,¹ the United States Supreme Court grappled not with case law but with fundamental questions about the nature of science and its role in law. The court in Daubert addressed the problematic issue of admissibility of expert scientific testimony. In the end the Court rejected as an exclusionary rule the venerable standard set in 1923 by Frye v. United States.² Frye held that scientific testimony was to be excluded unless it had gained “general acceptance” in its field.³ Daubert held that Rule 702 of the Federal Rules of Evidence displaced the Frye rule. It remains to be seen how admissibility of scientific testimony will play out in the federal courts now that Daubert has altered the Frye rule.

Daubert sent shock waves of uncertainty through the litigation bar.⁴ “The catch,” warned Supreme Court watcher David O. Stewart, “is that no one is exactly sure what the new standard is.”⁵ Admissibility of scientific testimony can be a critical factor in a broad range of litigation, and Daubert’s uncertain prognosis cuts a wide swath.

Science holds understandable allure for a party caught up in dispute within the American trial system. A trial is a battle over what constitutes historical truth. A party tries to convince the factfinder that her version of what happened is what happened. To the extent that scientific evidence presents convincing corroboration of one party’s version of truth, it can decide the case.⁶ Little wonder that scientific evidence is offered eagerly by litigators who manage to find

¹ 113 S. Ct. 2786 (1993).
² 293 F. 1013 (D.C. Cir. 1923).
³ Id. at 1014.
⁶ See Learned Hand, Historical and Practical Considerations Regarding Expert Testimony, 15 HARV. L. REV. 40, 52 (1901) ("Now the important thing and the only important thing to notice is that the expert has taken the jury's place if they believe him.").
a source of data and analysis favorable to their client’s version of the truth.\textsuperscript{7} Practitioners who would oppose the introduction of scientific testimony by an adversary at trial, however, no longer can rely on the simplistic, if unpredictable, “general acceptance” exclusionary standard of \textit{Frye}. Now they must contend with \textit{Daubert}. Persuasive admissibility and exclusion arguments will turn not on what \textit{Daubert} says but on what \textit{Daubert} means.

This Comment explores two sources of insight that may help practitioners come to terms with what \textit{Daubert} means. First, it evaluates the role of reliability and relevance in admissibility of scientific testimony. Then it examines instructive Maine state decisions handed down since 1978 without \textit{Frye} as an exclusionary rule. That dual exploration is presented in five parts. Following the Introduction, Part II presents a discussion of the use of science in the courtroom and the \textit{Frye} rule as the measure of admissibility of scientific evidence. Part III describes the Bendectin cases leading up to the United States Supreme Court’s decision in \textit{Daubert}. Part IV compares the 1993 decision in \textit{Daubert} with the 1978 decision of the Maine Supreme Judicial Court, sitting as the Law Court,\textsuperscript{8} in \textit{State v. Williams},\textsuperscript{9} which anticipated by fifteen years the United States Supreme Court’s rejection of \textit{Frye} as a tool for excluding scientific testimony. Part V considers the substitution by \textit{Daubert} and \textit{Williams} of “reliability” as the test for admissibility of scientific evidence in place of \textit{Frye}’s “general acceptance” standard. For insight into the application of Rule 702 without \textit{Frye}, Part VI discusses selected scientific evidence decisions made by the Law Court since \textit{State v. Williams}.

\textsuperscript{7} E.g., Paul C. Giannelli, \textit{The Admissibility of Novel Scientific Evidence: Frye v. United States, a Half-Century Later}, 80 COLUM. L. REV. 1197, 1200 (1980) (“[T]he use of scientific knowledge to solve legal problems has long been recognized, and it is not surprising that a society so dependent on science and technology should turn to such knowledge as a method of proof.”) (footnote omitted).

\textsuperscript{8} “[W]e should point out to beginning lawyers that the term ‘Law Court’ is peculiar to Maine. It derives from an old statute, now 4 M.R.S.A. § 57, which gives the Supreme Judicial Court jurisdiction to sit en banc ‘as a court of law.’ It has traditionally been used to distinguish the appellate function of the full Court from the nisi prius functions of single justices. Those unfamiliar with this tradition should not think that the word ‘Law’ is used in contradistinction to ‘Equity.’” \textit{FIELD & MURRAY, MAINE EVIDENCE} at xiii (1976).

\textsuperscript{9} 388 A.2d 500 (Me. 1978).
II. SCIENCE IN THE COURTROOM AND FRYE AS THE MEASURE OF ADMISSIBILITY OF SCIENTIFIC EVIDENCE

A. Science in the Courtroom

The power of scientific evidence flows from a fundamental characteristic science shares with trial: both are mechanisms employed to seek truth. However, science is not itself truth. Science is the accumulation of past experiences of those seeking truth.

In broadest terms, scientists seek a systematic organization of knowledge about the universe and its parts. This knowledge is based on explanatory principles whose verifiable consequences can be tested by independent observers. Science encompasses a large body of evidence collected by repeated observations and experiments. Although its goal is to approach true explanations as closely as possible, its investigators claim no final or permanent explanatory truths. Science changes. It evolves.

The accumulated history of observing, guessing, testing, measuring, and drawing conclusions therefrom occupies a full shelf in human endeavor. A party trying to establish at law where truth lies often looks to this prior experience, i.e., to science, for help. When he finds there some parcel of the record of human inquiry supporting a conclusion he wishes to have drawn in his own case, he offers it in support of his argument.

A party offers scientific evidence to show that someone else, looking at circumstances akin to his, has observed a consequence like the one he wishes the factfinder to believe. Science in the courtroom does not offer truth. It offers parallel, and therefore corroborating, circumstantial evidence.

Scientific testimony can play a critical role in both criminal and civil cases. Expert explanation of blood spatter tests can convince a jury that the state’s contention that a mortal wound was inflicted inside a particular vehicle is more likely to be the truth than a contradictory explanation offered by a man on trial for murder. Expert testimony can give a jury the news that others before them have observed, in systematic analysis, that it is possible for the calculated murder of a husband by an abused wife to be self defense. Measurements and test analyses explained by an expert from a na-


tional consumer institution can let a factfinder know that engineers have concluded that a car’s structural seat design inadequately protected against the secondary risks of impact.\textsuperscript{14} University researchers can describe for a jury how they reviewed medical studies of women who took a particular drug during pregnancy and observed in the data that women who took the drug bore children with birth defects statistically more frequently than those who did not take the drug.\textsuperscript{15}

Scientific testimony has the power to settle in a factfinder’s mind where truth more likely lies in the case at hand. If science \textit{were} truth, no harm would be done by such juror acquiescence. Science, however, is not truth, but a collection of tested hypotheses and observations based on those tests.\textsuperscript{16} The conclusions of science are always open to further testing and therefore always open to refinement.\textsuperscript{17}

\textbf{B. The Need to Define an Evidentiary Standard for Scientific Evidence}

The integrity of the trial process, sensitive to “false” evidence of any kind, is perceived as particularly vulnerable to misuse of scientific conclusions offered through expert testimony.\textsuperscript{18} On the one hand, shallowly drawn or uncertain conclusions admitted as evidence may be adopted as truth by jurors. Judges express concern that, in the face of testimony of someone with apparent training and expertise, who already has made her own observations on a critical issue now facing them, jurors may adopt the scientific conclusion as truth. Judges fear jurors may let the testimony subsume their own truth-finding responsibility or may overestimate the evidence’s de-

\begin{itemize}
\item[14.] See Ford Motor Co. v. Evancho, 327 So. 2d 201 (Fla. 1976).
\item[15.] See DeLuca v. Merrell Dow Pharmaceuticals, Inc., 911 F.2d 941 (3d Cir. 1990).
\item[16.] The theory of knowledge whose task is the analysis of the method or procedure peculiar to empirical science, may accordingly be described as a theory of the empirical method—a theory of what is usually called experience.
\item[17.] See Kuhn, \textit{supra} note 10, at 82-84.
\item[18.] See State v. Spencer, 216 N.W.2d 131, 134 (Minn. 1974) (“We are concerned, however, about the sweeping and unqualified manner in which [the expert’s] testimony was offered. Where expert testimony concerning a new scientific technique is heard by a jury, there is danger that the evidence may be given more weight than is warranted.”).
\end{itemize}
terminative value.¹⁹

On the other hand, the integrity of the trial process also is at risk where, in the name of protecting jurors from the influence of “junk” science, thoughtfully drawn scientific conclusions, based on good data, careful observation, and tested theory, are kept out of evidence on the ground that they never have been published in a scientific journal.²⁰ Overzealous screening of scientific evidence can deny the factfinder access to the worthy experience of others who previously have addressed with care a complicated question the factfinder now must decide.²¹ Either way, with sound science kept out or invalid science let in, the truth-determining process of trial is diminished.

Advocates are keenly aware of the impact of admissibility of scientific testimony. Those with a client whose version of the truth will be undermined by contrary conclusions of identified experts throw up blockades to keep those scientific conclusions out of evidence and

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¹⁹. See United States v. Addison, 498 F.2d 741, 744 (D.C. Cir. 1974) (observing that there is a danger that scientific evidence will be viewed by laymen as having “mystic infallibility”). See also United States v. Brown, 557 F.2d 541, 556 (6th Cir. 1977) (noting that confusion of the jury is an issue of concern with scientific evidence); Marshall v. Sellers, 53 A.2d 5, 10 (Md. 1947) (noting that because a jury must be capable of deciding how much weight to give evidence, the possibility that a jury may not be able to understand and assess foundations of expert scientific testimony is significant).

²⁰. Publication and peer review are mechanisms by which the scientific community attempts to validate work in the ongoing process that is science. See infra note 28 for discussion of scientific validity. Scientists rely on the course of public announcement (typically in a professional journal), followed by opportunity for open criticism from others in the field, as a way to weigh the observations of scientific research and subject its conclusions to the continued refinement and corroboration of the scientific process. See Bert Black, A Unified Theory of Scientific Evidence, 56 Fordham L. Rev. 595, 622-25 (1988). Publication of scientific observations and conclusions invites both challenges and attempts to replicate results.

The functional mechanism of science in which publication and peer review play a role parallels the mechanism that tests judicial opinions in the arena of legal criticism. See Kuhn, supra note 10, at 23 (a scientific paradigm “like an accepted judicial decision in the common law...is an object for further articulation and specification under new or more stringent conditions.”). Science seeks truth without respite. The law seeks justice without respite. Neither attains with finality its grail. Along the way, however, in both science and law, some conclusions inspire our confidence more than others. See Francisco J. Ayala & Bert Black, Scientific Criteria for Scientific Claims, in Judicial Control of Scientific Evidence: The Implications of Daubert 29-30 (A.B.A. Section of Business Law, 1993 Annual Meeting, New York, New York). These scientific conclusions, published or not, that inspire confidence are those arrived at via methods of principle and capable of withstanding the validation testing of the discipline. Popper, supra note 16, at 251 n.1 (Corroboration is the degree to which an hypothesis has stood up to severe tests, and thus “proved its mettle.”).

²¹. One case in which judicial caution kept out of evidence testimony on scientific technology accepted outside the courtroom is Berry v. Chaplin, 169 P.2d 442 (Cal. Dist. Ct. App. 1946). Testimony concerning paternity blood testing was excluded. On the basis of the mother's testimony, Charlie Chaplin was required to pay child support for a child that blood testing had demonstrated could not be his.
away from the jury’s consideration. Those who have located a scientific observation aligned with the conclusion they wish to have drawn in their client’s case argue that an expert ought to be allowed to share such evidence with the jury, even though the research methodology may be new or applied in only a single study.

Courts often must make legal decisions without the luxury of waiting for the results of thoughtful, well tested, thoroughly replicated scientific research.22 They often have to decide the admissibility of scientific conclusions that have yet to be vetted by years of research. Both the Federal and Maine Rules of Evidence make it the unenviable task of the judge to decide when expert scientific testimony will be admitted in evidence and when it must be kept out.23

Courts understand the problems associated with both inappropri-


23. Fed. R. Evid. 104 provides in relevant part:

(a) Questions of Admissibility Generally.

Preliminary questions concerning the qualification of a person to be a witness, the existence of a privilege, or the admissibility of evidence shall be determined by the court, subject to the provisions of subdivision (b). In making its determination it is not bound by the rules of evidence except those with respect to privileges.

(b) Relevancy Conditioned on Fact.

When the relevancy of evidence depends upon the fulfillment of a condition of fact, the court shall admit it upon or subject to, the introduction of evidence sufficient to support a finding of the fulfillment of the condition.

(e) Weight and Credibility.

This rule does not limit the right of a party to introduce before the jury evidence relevant to weight or credibility.

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(b) Relevancy Conditioned on Fact.

When the relevancy of evidence depends upon the fulfillment of a condition of fact, the court shall admit it upon the introduction of evidence sufficient to support a finding that the condition has been fulfilled. The court has discretion to admit evidence conditionally upon the representation that its relevancy will be established by evidence subsequently offered.

(e) Weight and Credibility.

This rule does not limit the right of a party to introduce before the jury evidence relevant to weight or credibility.
ately received and inappropriately excluded scientific evidence.\textsuperscript{24} Science is a dynamic body of observations-to-date, of working assumptions, of contingent and sometimes competing conclusions vulnerable to future invalidation or refinement. Given that science is not a set of "true facts" from which parties may draw to support their arguments but rather the record of an evolutionary process seeking truth, how is a judge to decide the evidentiary sufficiency of particular scientific testimony? When should expert scientific testimony come in? When should it be kept out? Courts have struggled to find an answer.\textsuperscript{25}

The court's struggle with scientific evidence is not to know truth in order that it may be admitted as evidence.\textsuperscript{26} Judges want to admit scientific evidence when it advances the search for truth in the trial process. They want to deny parties the use of scientific evidence when its observations and conclusions are the result of research so uncertainly performed that it threatens the search for truth. Courts must decide where to draw the line between truth-advancing and truth-threatening scientific research.\textsuperscript{27} The reliability of scientific evidence\textsuperscript{28} is a question of process, not of conclusion.


\textsuperscript{26} A conscientious scientist will weigh the available data and reach an assessment of its strength, but science cannot tell the scientists at what point the data are strong enough to warrant an award of compensation. One may or may not agree with the legal concepts and may propose alternatives, but one cannot look to science for an absolute decisionmaking standard because none exists.


\textsuperscript{27} For a focused collection of cases illustrating the courts' search for principles upon which to ground admissibility of scientific testimony see the "Bendectin cases," \textit{infra}, at notes 42 and 56.

\textsuperscript{28} Legal decisions may use the terms "validity" and "reliability" interchangeably and may not distinguish scientific reliability from evidentiary reliability. In science, validity means accuracy, the ability of a scientific test to measure what it says it measures. Scientific reliability is a measure of whether the test produces consistent results each time it is performed. A test that is scientifically valid is also scientifically reliable, but a test that is scientifically reliable is not necessarily valid. See Paul C. Gianelli \& Edward J. Imwinkelried, \textit{Scientific Evidence} § 1-1 n.1 (2d ed. 1993).

Evidentiary reliability is a measure of a court's confidence that proffered evidence has adequate circumstantial guarantees of trustworthiness. "The objective of screening scientific data to be used in litigation is to ensure that it is reliable or trustworthy." B.J. George, Jr., \textit{Statistical Problems Relating to Scientific Evidence}, in \textit{Scientific and Expert Evidence} 105, 118 (Edward J. Imwinkelried ed., 2d ed. 1981). Practitioners are familiar with the concept of evidentiary reliability in exceptions to the hearsay exclusion. \textit{Fed. R. Evid.} 803(24), 804(b)(5). A court can have no eviden-
But if scientific evidence admissibility turns on "reliability," how is a court to decide what constitutes "reliable" scientific evidence? What is the evidentiary standard to be?

C. The Rise and Fall of Frye v. United States

In 1923 apparent salvation hove into sight for judges beleaguered with the job of deciding the admissibility of complicated, controversial, and conflicting scientific testimony. Salvation took the form of a phrase in a terse two-page opinion in a case decided by the Court of Appeals of the District of Columbia. The case was Frye v. United States. The science at issue was lie detection. The key phrase was "general acceptance." The court wrote: "[W]hile 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."

Here was judicial relief. The test for admitting scientific evidence would be "general acceptance," which seemed easy enough to apply. The seed of "general acceptance" as the test for scientific evidence reliability, and hence for relevance and admissibility, fell on welcoming ground. In the words of one Maine commentator, the Frye rule "spread like crabgrass."

Federal and state courts across the country, including Maine, embraced the D.C. District Court's Frye test. At its half century mark the Frye test dominated decisions on admissibility of scientific evidence, but change was in the wind.

29. 293 F. 1013, 1014 (D.C. Cir. 1923) (holding that the favorable results of a systolic blood pressure test purportedly able to detect falsehoods offered by the defendant as proof of his veracity were inadmissible because the test had not yet gained enough standing and recognition among physiological and psychological authorities to justify the court's admitting its results in evidence).

30. Id. (emphasis added).

31. Author's discussion with Michael W. Mullane, Professor of Evidence, University of Maine School of Law.

32. See Reed v. State, 391 A.2d 364, 368 (Md. 1978) ("This criterion of 'general acceptance' in the scientific community has come to be the standard in almost all of the courts in the country which have considered the question of the admissibility of scientific evidence."). Maine first adopted the "general acceptance" test in State v. Casale, 110 A.2d 588, 592-93 (Me. 1954) (quoting Boeche v. State, 37 N.W.2d 593, 597 (Neb. 1949) (holding polygraph evidence generally inadmissible because it had "not yet received general scientific acceptance").

33. Gianelli, supra note 7, at 1205.

34. Id. at 1207-08 ("[T]he problems Frye has engendered—the difficulties in applying the test and the anomalous results it creates—so far outweigh [its] advantages..."
During the 1970s a chorus of criticism of Frye gained steam. The principal criticisms were that the "general acceptance" standard was keeping valid science out of evidence and that "general acceptance" was often difficult to determine. Amid this rising debate, Congress in 1975 enacted the Federal Rules of Evidence. Maine quickly followed suit; the Maine Supreme Judicial Court promulgated the Maine Rules of Evidence to be effective on February 2, 1976. Maine's Rules of Evidence closely track the federal rules. Maine and Federal Rules of Evidence 702 and 703, governing admission of expert testimony, are essentially identical. Neither rule sets an express "general acceptance" threshold for admissibility of scientific evidence. Both sets of rules are silent as to whether they specifically supersede Frye's general acceptance test.

In Maine it did not take long for a case to arise testing the viability of Frye under the new Rules of Evidence. In 1978 the Law Court held in State v. Williams:

On the approach we adopt the presiding Justice will be allowed a latitude, which the Frye rule denies, to hold admissible in a particular case proffered evidence involving newly ascertained, or applied, scientific principles which have not yet achieved general acceptance in whatever might be thought to be the applicable scientific community, if a showing has been made which satisfies the Justice that the proffered evidence is sufficiently reliable to be held relevant.

that the argument for adopting a different test has become overwhelming.

35. See id. at 1206. For typical criticism see 22 C. WRIGHT & K. GRAHAM, FEDERAL PRACTICE AND PROCEDURE § 5168 (1978) and C. McCORMICK, EVIDENCE § 203 (2d ed. 1972).


If scientific, technical, or other specialized knowledge will assist the trier of fact to understand the evidence or to determine a fact in issue, a witness qualified as an expert by knowledge, skill, experience, training, or education, may testify thereto in the form of an opinion or otherwise.


The facts or data in the particular case upon which an expert bases an opinion or inference may be those perceived by or made known to the expert at or before the hearing. If of a type reasonably relied upon by experts in the particular field in forming opinions or inferences upon the subject, the facts or data need not be admissible in evidence.

40. See GIANELLI, supra note 7, at 1229.

41. State v. Williams, 388 A.2d 500, 504 (Me. 1978). For a full discussion of Williams see Part IV of this Comment.
After Williams, scientific evidence that "will assist the trier of fact" would include profferings of something that had achieved less than "general acceptance," as long as such scientific testimony was "reliable." At the federal level fifteen more years passed before a decision declared Rule 702 free of the Frye test. The issue was brought to a head by a division in the federal circuit courts of appeal in what came to be known as the Bendectin cases. The deciding Bendectin case was Daubert v. Merrell Dow Pharmaceuticals, Inc.

In its 1993 decision in Daubert, the United States Supreme Court, like Maine's Law Court before it, rejected Frye's "general acceptance" rule as a test for excluding expert scientific testimony. "That austere standard," wrote Justice Blackmun for the unanimous court, "absent from and incompatible with the Federal Rules of Evidence, should not be applied in federal trials." 

III. THE BENDECTIN CASES CARRY DAUBERT V. MERRELL DOW TO THE UNITED STATES SUPREME COURT

Courts in 49 states and the District of Columbia had faced the scientific evidence issues raised by the Bendectin cases. Bendectin was a prescription anti-nausea drug marketed by Merrell Dow Pharmaceuticals. Although the U.S. Food and Drug Administration (FDA) approved Bendectin in 1956, in the 1970s public concern arose about the drug's possible relationship to birth defects suffered by the children of mothers who had taken it to combat the nausea of pregnancy. In 1980 the FDA's Advisory Committee on Fertility and Maternal Health reviewed Bendectin safety studies and pronounced that the data did not indicate an increased risk of birth defects associated with the drug's use.

Despite the FDA's assurances, however, plaintiffs filed thousands of "toxic tort" cases against Merrell Dow alleging that Bendectin was the cause of their children's birth defects. Results of the cases

43. 113 S. Ct. 2786 (1993).
44. Id. at 2794.
45. See Black, supra note 20, at 679.
46. As originally designed, Bendectin was a combination of three components: an antispasmodic, dicyclomine hydrochloride; an antihistamine, doxylamine succinate; and Vitamin B6, pyridoxine. Lynch v. Merrell-National Labs., 830 F.2d at 1191.
49. Id.
50. Id.
were mixed. Several large plaintiff's verdicts, however, coupled with
decreased use of the drug because of the controversy surrounding it,
caused Merrell Dow to stop producing Bendectin.51

Before Merrell Dow stopped production of Bendectin, two Califor-
nia women, Joyce Daubert and Anita de Young, took it during preg-
nancy. Each subsequently bore a son with limb reduction birth de-
defects. As guardians ad litem on behalf of their infant children,
parents William and Joyce Daubert and Michael Schuller and Anita
de Young sued Bendectin manufacturer Merrell Dow in United
States District Court for the Southern District of California for
damages for the children's injuries. The district court consolidated
these cases as Daubert v. Merrell Dow Pharmaceuticals, Inc.52

A. The Daubert Trial Court Decision

After extensive discovery, defendant Merrell Dow moved for sum-
mary judgment on grounds that the plaintiffs had failed to sustain
their burden of establishing a genuine issue of material fact as to
causation.53 At the motion hearing in October, 1989, plaintiffs of-
fered testimony and affidavits from eight experts54 who wished to
present their conclusion, based on in vitro studies, chemical struc-
ture analysis, animal studies, and re-analysis of previously published
data, that there existed a significant relation between Bendectin and
birth defects.55 This was not enough for the court, which granted
Merrell Dow's motion for summary judgment. Unfortunately, the
court's rationale for granting summary judgment is not clear.

Citing Bendectin decisions from the First, Fifth, Sixth, and Dis-
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admit any testimony not based on published epidemiological studies.57 "The federal courts have held that epidemiological studies are the most reliable evidence of causation in this area. Accordingly, expert opinion that is not based on epidemiological evidence is not admissible to establish causation because it lacks the sufficient foundation necessary under FRE 703."58

In addition, in a confusing final paragraph, the court declared insufficient the plaintiffs' proffered "re-analysis" testimony, which was based on data from earlier published epidemiological studies but which arrived at conclusions different from those of the published studies' authors.59 In finding the plaintiffs' re-analysis wanting, the Daubert trial court relied on the fact that the recalculation done by the plaintiffs' expert witnesses was never published or subjected to peer review and did not state an explicit statistical confidence level.60 On this basis the trial court ruled that these epidemiology experts' opinion, that re-analysis showed a "statistically significant" association between Bendectin and birth defects, was insufficient to take the matter to a jury.61

The scientific testing method known as epidemiology was an important focus of the Bendectin cases. Epidemiology is the study of the incidence of disease in a population.62 An epidemiological study examines the relationship between exposure to particular factors and the occurrence of death or injury in a particular population, compared to normal background levels.63

son v. Richardson-Merrell, 857 F.2d 823 (D.C. Cir. 1988) (expert testimony that Bendectin caused birth defects, when based on animal and chemical tests and reanalysis of epidemiological studies, was inadmissible under Fed. R. Evid. 703)).

57. Daubert v. Merrell Dow Pharmaceuticals, Inc., 727 F. Supp. at 572 ("A necessary predicate to the admission of scientific evidence is that the principle upon which it is based 'must be sufficiently established to have general acceptance in the field to which it belongs.'" (quoting United States v. Kilgus, 571 F.2d 508, 510 (9th Cir. 1978)) (additional citations omitted).

58. Id. at 575.

59. Reflecting years of doctrinal confusion about scientific evidence, neither of the lower court decisions in Daubert is a model of clarity. Though the trial court based its holding on evidentiary rules and cases related to admissibility, its language seems more keyed to the issue of sufficiency. The last paragraph of its decision addresses the legal insufficiency of the inferences one might draw from the plaintiffs' evidence, which hardly would matter if the evidence were inadmissible.


61. Id. at 576.


63. See Khristine L. Hall & Ellen K. Silbergeld, Reappraising Epidemiology: A
Epidemiological studies cannot supply direct evidence of causation; they can, however, provide circumstantial evidence of cause and effect. Epidemiology can strengthen an inference that Bendectin is an agent that causes birth defects, i.e., that Bendectin is a "teratogen."

When Merrell Dow moved at the Daubert trial court hearing for summary judgment, it proffered among other evidence in support of its motion the affidavit of an epidemiologist who had reviewed thirty published epidemiology studies involving more than 130,000 patients. Merrell Dow's epidemiologist concluded that no single published epidemiological study demonstrated a statistically significant association between Bendectin and birth defects. The plaintiffs did not challenge this summary of published studies but asked to be able to introduce their own experts' contravening testimony.

The trial court ruling that only published epidemiological evidence could be admitted, however, denied the plaintiffs the opportunity to present their evidence from in vitro studies, chemical structure analysis, and animal studies. Their proffered re-analysis, which was based on previously published epidemiological data, was ruled insufficient to get the case before the jury. "The court feels that the strongest inference to be drawn for plaintiffs based on the epidemiological evidence is that Bendectin could possibly have caused plaintiffs' injuries, therefore summary judgment is proper against them."

The Daubert trial court's confusion with respect to admissibility, sufficiency, and the Federal Rules of Evidence, and how these relate, illustrates the need for careful separation of issues in analyzing admissibility of scientific evidence. The court grappled with evaluating

Response to Mr. Dore, 7 HARV. ENVTL. L. REV. 441, 443 (1983).

64. See DeLuca v. Merrell Dow Pharmaceuticals, Inc., 911 F.2d at 945 (citing K. J. Rothman, MODERN EPIDEMIOLOGY 116 (1986)).

65. A medical researcher begins by putting forward the hypothesis that there is no association between Bendectin and an increase in limb reduction defects. Control group studies then test this so-called null hypothesis. If birth defects occur with higher frequency in a group of mothers whose only difference from the control group is Bendectin use, the null hypothesis is rejected and the conclusion can be drawn that there is evidence of some association between the drug and increased birth defects. See id.

Such evidence does not directly "prove" Bendectin creates a higher risk of birth defects, but when the sampling error of the research is small enough that the observed increase is unlikely to have been the result of chance, the research can support an inference of causation. Sampling error is measured by statistical analysis known as "significance testing." See id. at 946-47 (citing Rothman, supra note 64). For a general discussion of significance testing, see David W. Barnes & John M. Conley, STATISTICAL EVIDENCE IN LITIGATION chs. 3, 4 (1986).


the trustworthiness of plaintiffs' evidence, with its evidentiary "reliability," but never succeeded in clarifying its standard of decision. In its search for an admissibility standard to which to hold plaintiffs' evidence, the *Daubert* trial court tangled the requirements of Rules 702 and 703 and compounded the confusion with phrases drawn from the "general acceptance" common law standard for admissibility and from Rule 403's prohibition of misleading testimony.

**B. The Daubert Court of Appeals Decision**

The *Daubert* plaintiffs, unsuccessful in federal district court, appealed to the Ninth Circuit Court of Appeals. The Ninth Circuit, however, excluded all of the plaintiffs' evidence, making any review of the weight of the evidence academic. The Ninth Circuit Court of Appeals in its brief *Daubert* opinion explicitly looked to the *Frye* test to exclude the plaintiff's offered testimony. The court declared that expert scientific testimony is admissible only if it is generally accepted among the scientific community. Declaring it inappropriate to allow this threshold issue of the evidentiary reliability of scientific evidence to be left to each trial judge's discretion, the Ninth Circuit reviewed de novo the plaintiffs' offered evidence for admiss-

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69. *Daubert v. Merrell Dow Pharmaceuticals, Inc.*, 727 F. Supp. at 572. The court tries to explain the basis for its decision in a series of confused steps that appear to the Author of this Comment to be distillable as follows. The court says that Fed. R. Evd. 703 restricts the admissibility of expert scientific testimony (although Rule 703's reference to reliance applies to underlying decisional data that need not be admitted by virtue of being a type relied upon in the expert's field, for example, where a doctor's opinion is based on non-admitted blood tests). The court goes on to say, "A necessary predicate to the admission of scientific evidence is that the principle upon which it is based 'must be sufficiently established to have general acceptance in the field to which it belongs.'" *Id.* (citing United States v. Kilgus, 571 F.2d 508, 510 (9th Cir. 1978)). The court concludes by mixing these two requirements into an amalgam that does not follow: expert opinion not based on facts or data "of a type reasonably relied upon by experts in the particular field" is not helpful, but instead is confusing or misleading and should therefore be excluded. See Fed. R. Evd. 403. Unfortunately, the court's analysis treats Rule 703 as a general rule of exclusion rather than as an opportunity for admitting expert opinion testimony without also having to admit underlying decisional data.

70. *Daubert v. Merrell Dow Pharmaceuticals, Inc.*, 951 F.2d at 1131.

71. *Id.* at 1129 (quoting United States v. Solomon, 753 F.2d 1522, 1526 (9th Cir. 1985) (citing *Frye v. United States*, 293 F. at 1014)).
bility. Seeking to articulate the standard of general acceptance, the court relied on Bendectin case decisions from three other circuit courts that had found for Merrell Dow when plaintiffs could produce no published and peer-reviewed epidemiological studies of their own as evidence. "Lynch, Richardson, and Brock," the Ninth Circuit said, "reflect a well-founded skepticism of the scientific value of the reanalysis methodology employed by plaintiffs' experts. . . ." Ruling that re-analysis of epidemiological studies is generally accepted by the scientific community only when it is subjected to verification and scrutiny by others in the field, that is, only when it is published for peer review, the Ninth Circuit followed her three sister circuits and affirmed the trial court's summary judgment in Merrell Dow's favor:

[W]e agree with the district court that the available animal and chemical studies, together with plaintiffs' expert reanalysis of epidemiological studies, provide insufficient foundation to allow admission of expert testimony to the effect that Bendectin caused plaintiffs' injuries. Accordingly, plaintiffs could not satisfy their burden of proving causation at trial.

In following this view, the Ninth Circuit expressly declined to follow a strong contrary opinion by the Third Circuit in the 1990 Bendectin case of DeLuca v. Merrell Dow Pharmaceuticals, Inc. By the time it came to decide DeLuca, the Third Circuit already had rejected the Frye rule of general acceptability as the threshold test for admissibility of scientific evidence. The Ninth Circuit, which still held to Frye, relied on this difference to distinguish the DeLuca analysis from its own in Daubert. The Third Circuit's evidentiary analysis in DeLuca ultimately would reappear, to be ratified, in the United States Supreme Court's 1993 decision on plaintiffs' appeal from the Ninth Circuit's judgment in Daubert v. Merrell Dow.

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72. Id. at 1131.
74. Daubert v. Merrell Dow Pharmaceuticals, Inc., 951 F.2d at 1131.
75. Id. The language of the Daubert trial court, by comparison, seems to indicate the court was willing to admit re-analysis evidence but found it insufficient to allow the matter to go to the jury. See Daubert v. Merrell Dow Pharmaceuticals, Inc., 727 F. Supp. at 576.
76. 911 F.2d 941, 942 (3d Cir. 1990).
78. See Daubert v. Merrell Dow Pharmaceuticals, Inc., 951 F.2d at 1130-31.
C. The U.S. Supreme Court Decision in Daubert

The Supreme Court granted certiorari in the Daubert case because of the "sharp division" in the courts of appeal on the standard for admission of scientific evidence. Basing its decision on the Federal Rules of Evidence, the Court vacated the Court of Appeals summary judgment for Merrell Dow and remanded the case for review of the evidence without the "general acceptance" requirement of Frye.

When the dust finally settled in the Bendectin saga on scientific evidence admissibility, the Supreme Court had used Daubert both to transform the Frye rule and to interpret the requirements of Federal Rule of Evidence 702. No longer is "general acceptance" a standard for excluding scientific testimony. Daubert relegates general acceptance to use only as one of several possible arguments for admitting scientific evidence, and then only to the extent that general acceptance can demonstrate scientific validity and therefore evidentiary reliability. However, evidence will not get a free ride into court simply by virtue of being offered as scientific. Daubert interprets Rule 702 as requiring judicial screening of the evidentiary reliability of scientific evidence before it can be admitted.

Daubert was a battle on two fronts: (1) whether the Frye rule, requiring general acceptance for admissibility of scientific evidence, should be retained as an exclusionary mechanism, and (2) whether Federal Rule of Evidence 702 requires any level of judicial screening at all before scientific expert evidence can be admitted. In Daubert the United States Supreme Court ultimately gave relief to the plaintiffs by displacing the Frye rule. At the same time, the court responded to the defendant's concerns by requiring some judicial screening of scientific evidence for evidentiary reliability under Rule 702.

82. Id. at 2799.
83. Id. at 2794. ("That austere standard, absent from and incompatible with the Federal Rules of Evidence, should not be applied in federal trials.") (footnote omitted).
84. For discussion of the role of "general acceptance" in admitting scientific evidence, see infra notes 98-99 and accompanying text.
85. Daubert v. Merrell Dow Pharmaceuticals, Inc., 113 S. Ct. at 2797. ("Finally, 'general acceptance' can yet have a bearing on the inquiry. A 'reliability assessment does not require, although it does permit, explicit identification of a relevant scientific community and an express determination of a particular degree of acceptance within that community.'" (quoting United States v. Downing, 753 F.2d at 1238)). The lack of widespread acceptance of a scientific claim can be raised by opponents of such evidence not as a per se ground for exclusion but to trigger skepticism in the court and therefore a closer scrutiny of the proponent's showing of the claim's scientific validity. See id. at 2797.
86. Id. at 2797-98.
Fifteen years earlier, the Maine Supreme Judicial Court, sitting as the Law Court, had announced the same result under Maine law in *State v. Williams.*

### IV. **Daubert Compared to State v. Williams**

#### A. State v. Williams

In 1976 Maine's Kennebec County Superior Court found Thomas Williams guilty of the criminal offense of terrorizing. The jury found that Mr. Williams was the caller who had telephoned the dispatcher at the Augusta Police Department to announce that a bomb was going to go off at the Augusta airport. At Williams's trial, the prosecution submitted a magnetic tape recording of the bomb threat as well as another tape of the defendant reading out loud. The prosecution proposed to call expert witnesses from Michigan State University and the Michigan Department of State Police to use speech spectrograph technology to match the recorded voices and identify the voice on the bomb threat tape as that of the defendant. The defendant produced two witnesses, an expert from City College of New York and a consultant to the Stanford Research Institute, to oppose this evidence. They testified at preliminary admissibility proceedings that use of speech spectrograph voice identification was unreliable in forensic situations and that such evidence was not admissible because the scientific community had not "generally accepted the speech spectrograph as a scientifically reliable method of voice identification."

Over the defendant's objections, the presiding judge allowed the State’s experts to present their speech spectrograph voice identification testimony at trial. Both experts identified the voice of the threatening telephone caller as the defendant's. Williams appealed his subsequent conviction to the Law Court, on the ground that it was error to admit in evidence the speech spectrograph testimony. The Law Court affirmed his conviction.

#### B. Williams and Daubert Present Parallel Issues

Justice Wernick, writing for the Law Court majority in 1978, defined the first issue in *Williams*: "The threshold question we confront is to determine what standard, under the law of evidence, governs admissibility in relation to the type of evidence here involved." Fifteen years later, in opening the United States Su-
Supreme Court's Daubert decision, Justice Blackmun's words paralleled Justice Wernick's: "In this case we are called upon to determine the standard for admitting expert scientific testimony in a federal trial." In both Williams and Daubert analysis quickly focused on the general acceptance test set out in Frye.

The defendant in Williams had argued that speech spectrograph voice identification was a new application of scientific principles and therefore its admissibility as evidence should be governed by the special standard set forth in Frye v. United States. Frye required that there be general acceptance of such newly discovered or applied scientific principle before the testimony could be admitted. The Law Court refused to adopt the defendant's position, believing it would be at odds with the fundamental philosophy of the Maine Rules of Evidence. In Maine, Frye and its general acceptance rule would not be allowed to constrain the rules of evidence. A scientific claim, if established as valid, need not be generally accepted in order to be reliable enough for admission in evidence in Maine.

The Supreme Court faced in Daubert the same question the Law Court faced in Williams: What role should "general acceptance" play in admitting scientific evidence? The Dauberts' primary attack was on the continuing authority of the Frye rule. They argued that the Frye test was superseded by the Federal Rules of Evidence. Said Justice Blackmun for the Court, "We agree." The United States Supreme Court thus removed from federal admissibility decisions the use of Frye as a tool of exclusion. Federal courts, like Maine courts, would decide the admissibility of scientific evidence without allowing Frye's general acceptance requirement to block expert testimony.

In both Maine and federal courts, however, general acceptance continues to serve a limited purpose in admission of scientific and technological evidence. In Williams, Justice Wernick quoted McCormick on Evidence: "'General scientific acceptance' is a proper condition for taking judicial notice of scientific facts, but not a criterion for the admissibility of scientific evidence." The Law Court in

95. Id. at 503. The court stated that the Maine Rules of Evidence favor "the admissibility of expert testimony whenever it is relevant and can be of assistance to the trier of fact."
97. The Law Court adopts Professor McCormick's language distinguishing scientific "facts" from other scientific evidence. State v. Williams, 388 A.2d at 503 (citing McCormick, supra note 35, § 203 at 491). However, it is clear from a full reading of Williams that the Law Court treats scientific "facts" as distinguishable from any other scientific evidence only in the level of evidentiary reliability assigned by the court. McCormick's scientific "fact" is merely a conclusion drawn from scientific methodology in whose validity the court has complete confidence.
Williams established that, under Maine Rule of Evidence 702, scientific validity confers evidentiary reliability and admissibility. After Williams, "general acceptance" cannot confer admissibility on a scientific claim. "General acceptance" may be invoked in argument only as a shorthand description for extended rigorous testing that an hypothesis has withstood unscathed. However, the contention of "general acceptance by the scientific community" as a shorthand substitute for documented validation is vulnerable to challenge to produce such documentation. In Daubert, Justice Blackmun as well assigned to general acceptance a shorthand role in admitting, but not in excluding, scientific evidence. "Widespread acceptance can be an important factor in ruling particular evidence admissible . . . ."

C. The Standard of Admissibility for Scientific Evidence Is a Creature of The Rules of Evidence

Having assigned "general acceptance" only a limited role to work on behalf of admissibility of evidence, the Law Court in Williams went on to describe the Rules standard for admitting scientific evidence. Evidence will not be admitted simply because it is offered as scientific. Admissibility will be appropriate only when the proffered evidence passes through the several screenings of the Maine Rules of Evidence. Proffered scientific evidence must roll through the Rules like a ball bearing in a pinball machine, successively and successfully passing one applicable gate after another, in order to be admitted. There will be no shortcuts and no simplistic bright line tests. Justice Wernick in Williams specifically addressed Rules 402, 403, and 702.

The Maine Rules of Evidence adopted in 1976 do not purport to establish a special standard to govern the admissibility of testimony involving newly ascertained, or applied, scientific principles. Under the [Maine] Rules of Evidence all "relevant" evidence is

98. "General acceptance" per se has no relevance in admitting scientific evidence except to the extent that the validation "general acceptance" purports to describe can be documented. Opponents are free to demand that such documentation be produced. To avoid misunderstanding of the role of "general acceptance" in admissibility arguments, if one means to say that a scientific claim is the result of a thorough and documented validation process it is best to say so, without resort to the shorthand of "general acceptance."

99. Daubert v. Merrell Dow Pharmaceuticals, Inc., 113 S. Ct. at 2797. The only meaningful role left for lack of general acceptance in excluding scientific evidence is in raising the court's skepticism as to the reliability of the claim. Id. See supra note 85.

100. The Maine Rules of Evidence "to a great degree parallel the Federal Rules of Evidence . . . ." Field & Murray, supra note 8, at xiii. (In particular, Me. R. Evid. 401-403, 701-703, and 706 are virtually identical to Fed. R. Evid. 401-403, 701-703, and 706.)
admissible
“except as limited by constitutional requirements or as otherwise provided by statute or by . . . rules applicable in the courts of this state.” Rule 402, M.R. Evid.

In Rule 702, specific reference is made to the admissibility of scientific testimony:
“If scientific, technical, or other specialized knowledge will assist the trier of fact to understand the evidence or to determine a fact in issue, a witness qualified as an expert by knowledge, skill, experience, training, or education, may testify thereto in the form of an opinion or otherwise.”

As also potentially affecting a case of this nature, Rule 403 provides a general limitation on the admissibility of relevant evidence:
“Although relevant, evidence may be excluded if its probative value is substantially outweighed by the danger of unfair prejudice, confusion of the issues, or misleading the jury, or by considerations of undue delay, waste of time, or needless presentation of cumulative evidence.”101

While Maine rejects the general acceptance test of Frye, Maine courts are not entirely without a screening mechanism for scientific evidence. The screening mechanism for scientific evidence, the Law Court said in Williams, is the Maine Rules of Evidence in the hands of the presiding judge.

The controlling criteria regarding the admissibility of expert testimony, so long as the proffered expert is qualified and probative value is not substantially outweighed by the factors mentioned in Rule 403, are whether in the sound judgment of the presiding Justice the testimony to be given is relevant and will assist the trier of fact to understand the evidence or to determine a fact in issue.

. . . On the approach we adopt the presiding Justice will be allowed a latitude, which the Frye rule denies, to hold admissible in a particular case proffered evidence involving newly ascertained, or applied, scientific principles which have not yet achieved general acceptance in whatever might be thought to be the applicable scientific community, if a showing has been made which satisfies the Justice that the proffered evidence is sufficiently reliable to be held relevant.102

Fifteen years later, Justice Blackmun in Daubert echoed the Maine Law Court’s position in Williams. Daubert relegated “general acceptance” to providing “shorthand” support for admissibility, but

101. State v. Williams, 388 A.2d at 503 (footnote omitted). “‘Relevant evidence’ means evidence having any tendency to make the existence of any fact that is of consequence to the determination of the action more probable or less probable than it would be without the evidence.” ME. R. EVID. 401.
102. State v. Williams, 388 A.2d at 504.
the United States Supreme Court had no intention of indiscriminately flinging the gates open to all "scientific" evidence.

That the Frye test was displaced by the Rules of Evidence does not mean, however, that the Rules themselves place no limits on the admissibility of purportedly scientific evidence. Nor is the trial judge disabled from screening such evidence. To the contrary, under the Rules the trial judge must ensure that any and all scientific testimony or evidence admitted is not only relevant, but reliable.103

The Supreme Court in Daubert, like the Law Court in Williams before it, assigned to the trial judge the task of gatekeeper for scientific evidence.104 The Supreme Court vacated the Ninth Circuit judgment and remanded Daubert for decision under the Rules of Evidence.105 The standard federal courts, like Maine courts, will use in deciding the admissibility of scientific evidence will be "reliability."

V. "RELIABILITY" AS THE STANDARD FOR DETERMINING ADMISSIBILITY OF SCIENTIFIC EVIDENCE

"Reliability" is a term of art in scientific evidence admissibility. Evidentiary reliability, or trustworthiness, is a function of the validity of the science involved. As the Supreme Court said in Daubert, "In a case involving scientific evidence, evidentiary reliability will be based upon scientific validity."106 The source of the reliability requirement is the Federal Rules of Evidence.

A. The Source of the Reliability Requirement

The Supreme Court in Daubert identified the "primary locus" of the obligation of reliability as Rule 702.107 In doing so the Court relied on two admissibility requirements of Rule 702: that the expert's testimony be of "scientific knowledge" and that it "assist" the trier of fact.

First the Court addressed Rule 702's requirement of scientific

104. Id. at 2796 ("Faced with a proffer of expert scientific testimony, then, the trial judge must determine at the outset, pursuant to Rule 104(a), whether the expert is proposing to testify to (1) scientific knowledge that (2) will assist the trier of fact to understand or determine a fact in issue. This entails a preliminary assessment of whether the reasoning or methodology underlying the testimony is scientifically valid and of whether that reasoning or methodology properly can be applied to the facts in issue."). (See Fed. R. Evm. 104 and Me. R. Evm. 104, supra note 23).
106. Id. at 2795 n.9.
107. Id. at 2795 ("[U]nder the Rules the trial judge must ensure that any and all scientific testimony or evidence admitted is not only relevant, but reliable. The primary locus of this obligation is Rule 702, which clearly contemplates some degree of regulation of the subjects and theories about which an expert may testify.").
knowledge as demanding evidentiary reliability. In order to be scientific, evidence must be reliable. "In short, the requirement that an expert's testimony pertain to 'scientific knowledge' establishes a standard of evidentiary reliability."\(^{108}\) While Justice Blackmun did not expand on this statement, the trial court's position must follow from acceptance of the underlying implication: if a conclusion is scientifically valid, then it is trustworthy\(^{109}\) and reliable as evidence. Once the implication of evidentiary reliability from scientific validity is accepted, a conclusion that necessarily must follow is that if offered testimony cannot satisfy the court as being reliable, it cannot have been scientific. The conclusion is the contrapositive of the underlying implication and as such is of identical formal logical truth value. Evidentiary reliability therefore becomes a threshold standard for qualification as scientific evidence. Evidence the court finds unreliable cannot pass muster as having withstood scientific testing. If it had withstood scientific testing, it would qualify as reliable. Therefore, if the court finds evidence untrustworthy and not reliable, it cannot begin to qualify as scientific knowledge and is therefore inadmissible.

Second, the Court saw reliability implicated in the Rule 702 requirement that scientific evidence must assist the factfinder. The link between assisting the factfinder and the reliability requirement is relevance. The Court began by noting that "Rule 702's 'helpfulness' standard requires a valid scientific connection to the pertinent inquiry as a precondition to admissibility."\(^{110}\) That is, to assist the jury, scientific evidence must be relevant.\(^{111}\) In moving from relevance to a requirement of reliability, the Court relied on an implicit syllogism: unreliable evidence is irrelevant; irrelevant evidence does not assist the jury; therefore unreliable evidence does not assist the jury. Because scientific evidence is required by Rule 702 to assist the jury, scientific evidence is required by Rule 702 to be reliable.

Justice Wernick in Williams also used relevance to tie reliability to Rule 702's requirement that scientific evidence assist the jury. "The controlling criteria regarding the admissibility of expert testimony . . . are whether in the sound judgment of the presiding Justice the testimony to be given is relevant and will assist the trier of fact to understand the evidence or to determine a fact in issue."\(^{112}\)

\(^{108}\) Id.

\(^{109}\) The Supreme Court reiterated the definition of reliability. "[O]ur reference here is to evidentiary reliability—that is, trustworthiness." Id. at 2795 n.9.

\(^{110}\) Id. at 2796.

\(^{111}\) Id. at 2795 ("Rule 702 further requires that the evidence or testimony 'assist the trier of fact to understand the evidence or to determine a fact in issue.' This condition goes primarily to relevance. 'Expert testimony which does not relate to any issue in the case is not relevant and, ergo, non-helpful.'" (quoting 3 Weinstein & Berger ¶ 702[02], at 702-18)).

\(^{112}\) State v. Williams, 388 A.2d at 504.
Under the rule the Law Court adopted in Williams, the presiding judge will admit proffered scientific evidence if a showing has been made that satisfies the judge that the evidence is sufficiently reliable to be relevant.113

This relevance link identified in both Daubert and Williams as tying the admissibility of scientific evidence to its reliability implicates several Rules of Evidence in addition to Rule 702. Unreliable “scientific” evidence fails at the threshold to satisfy the relevance requirement of Rules of Evidence 104(b),114 401-402,115 and 403.116 In addition, even if evidence is based on valid scientific principles, it still may be unreliable if it is inappropriately applied. Inappropriately applied principles also fail to meet the relevance requirement of Rules 401-403. Science that suffers from unreliable application to data also may implicate Rule 703,117 even though its underlying observations and conclusions are valid.118

113. See id.
115. Me. R. Evid. 401 and Fed. R. Evid. 401 are identical: “‘Relevant evidence’ means evidence having any tendency to make the existence of any fact that is of consequence to the determination of the action more probable or less probable than it would be without the evidence.”
Me. R. Evid. 402 and Fed. R. Evid. 402 differ only in their state/federal references to statutory limitations on relevant evidence. Under the Maine rule, “[A]ll relevant evidence is admissible, except as limited by constitutional requirements or as otherwise provided by statute or by these rules or by other rules applicable in the courts of this state. Evidence which is not relevant is not admissible.” Me. R. Evid. 402. Under the federal rule, “[A]ll relevant evidence is admissible, except as otherwise provided by the Constitution of the United States, by Act of Congress, by these rules, or by other rules prescribed by the Supreme Court pursuant to statutory authority. Evidence which is not relevant is not admissible.” Fed. R. Evid. 402.
116. Fed. R. Evid. 403 and Me. R. Evid. 403 are identical: “Although relevant, evidence may be excluded if its probative value is substantially outweighed by the danger of unfair prejudice, confusion of the issues, or misleading the jury, or by considerations of undue delay, waste of time, or needless presentation of cumulative evidence.”
117. See supra note 39 for the text of Fed. R. Evid. 703, which is virtually identical to Me. R. Evid. 703.
118. Testimony involving scientific theory that is venerable and reliable still may fail Rule 703. Both Me. R. Evid. 703 and Fed. R. Evid. 703 allow a qualified expert to testify as to his opinion based on data that is not in evidence, and in fact may not even be admissible in evidence, if that data is of a type reasonably relied on by experts forming opinions in that particular field. Reasonable reliance by a testifying expert upon a particular kind of data is an issue separate from the requirement of establishing the fundamental reliability of the underlying scientific methodology. The question as to whether a doctor may testify under Rule 703 without introducing into evidence all the test results, medical reports, and x-rays upon which he relied in making a diagnosis can be seen as an inquiry into scientific application of an acceptably reliable methodology. Once reliability of the underlying scientific methodology of diagnosis is established, it is also necessary, if an expert wishes to testify based on inadmissible or non-admitted data, to establish that the data relied upon were of a kind reasonably relied upon in applying such admissible methodology. The issue that
In practice the distinction between viewing admissibility of scientific evidence as an indirect function of reliability through the "will assist the trier of fact" relevance requirement of Rule 702 or through the direct relevance requirement of Rule 402 pales. Either way, the admissibility of scientific evidence turns on relevance, and relevance turns on the scientific validity and reliability of the proffered evidence. But how does a judge decide when "scientific" evidence is reliable?

B. Evidentiary Reliability and Judicial Confidence

Reliability, as the term is used in admitting scientific evidence, is a question of judicial confidence. The court must decide if the testimony offered is sufficiently trustworthy to be allowed in evidence. Reliability acquires definition by the assigning or withholding of confidence by the court.

The Supreme Court in Daubert made clear that assessment of the reliability of scientific evidence means finding out if the "science" in question is validly derived and validly applied. Courts are not required to decide if the content and substance of the claim are "correct" or "true." The Court said:

The inquiry envisioned by Rule 702 is, we emphasize, a flexible one. Its overarching subject is the scientific validity—and thus the evidentiary relevance and reliability—of the principles that underlie a proposed submission. The focus, of course, must be solely on principles and methodology, not on the conclusions that they generate.

arises when an expert opinion is based on a type of data not reasonably relied upon in a field, thus requiring such data to be admitted into evidence under Rule 703, is to be distinguished both from the issue of whether or not the underlying theory—as tested upon earlier data observations—is reliable as well as from the issue of whether a reliable theory has been improperly applied. For a discussion of these issues see Christophersen v. Allied Signal Corp., 939 F.2d 1106, 1114, 1118 (5th Cir. 1991) (per curiam), cert. denied, 112 S. Ct. 1280 (1992) (affirming trial court's exclusion of physician's testimony that exposure to nickel and cadmium fumes had caused plaintiff's cancer).

The second component of 'relevance' is 'probative value' or 'logical relevance.' Richard O. Lempert & Stephen A. Saltzburg, A Modern Approach to Evidence 153 (2d ed. 1982) (evidence is relevant if it 'tends logically to prove or disprove some fact in issue'). It is this component that relates directly to scientific validity. If scientific information is not valid, it does not increase or decrease the likelihood of any fact in issue.


See supra note 28 for a discussion of evidentiary reliability, scientific validity, and trustworthy evidence.

Daubert v. Merrell Dow Pharmaceuticals, Inc., 113 S. Ct. at 2797.

Id. (emphasis added) (footnote omitted).
In order to understand this term of art, "evidentiary reliability," in the context of scientific evidence, it is helpful to look further into the nature of science. Inquiry into the reliability of scientific evidence addresses both the validity of the underlying reasoning and methodology and the appropriateness of the methodology's application to the facts. The first step in assessing evidentiary reliability of a scientific claim is to inquire into whether its underlying hypothesis is testable. Any hypothesis that cannot be subjected to the possibility of rejection by observation and experiment is not science. That is, any hypothesis that cannot be tested empirically is not science. "Falsifiability" is the criterion of demarcation that distinguishes the empirical sciences from other forms of knowledge. A claim that the sun rises because Mother Nature causes it to do so cannot be tested and is not science.

Once a claim has been identified as being testable, the inquiry into its evidentiary reliability next asks if in fact it has been tested. A claim that is testable but never tested is not science. One that is tested sufficiently to invoke confidence in its conclusions, although never absolutely verifiable, is said to have been corroborated. The degree of corroboration of a scientific claim is not the number but the rigor of the tests to which that claim has been subjected.

One critical, rigorous test may be enough to move scientists to have preliminary confidence in a particular conclusion, though they

123. See supra note 104.
124. See Ayala & Black, supra note 20, at 7.
125. "Empirical" is defined as "originating in or relying or based on factual information, observation or direct sense experience usu. as opposed to theoretical knowledge." WEBSTER'S THIRD NEW INTERNATIONAL DICTIONARY (1986).
126. See Ayala & Black, supra note 20, at 6 (citing POPPER, supra note 16).
127. POPPER, supra note 16, at 44-45 ("Now I hold that scientific theories are never fully justifiable or verifiable, but they are nevertheless testable. . . . We do not take even our own observations quite seriously, or accept them as scientific observations, until we have repeated and tested them."); id. at 47 ("[T]here can be no ultimate statements in science: there can be no statements in science which cannot be tested, and therefore none which cannot in principle be refuted. . . .").
129. A hypothesis that has passed many empirical tests may be said to be "corroborated." The degree of corroboration is not simply a matter of the number of tests, but rather their severity. Severe tests are precisely those very likely to have outcomes incompatible with the hypothesis if the hypothesis is false. The more precise the predictions being tested, the more severe the test. A so-called critical or crucial test is an experiment for which competing hypotheses predict alternative, mutually exclusive outcomes. A critical test thus will corroborate one hypothesis and falsify the others.

A single critical test will often suffice for scientists in a given discipline to accept a hypothesis, at least for the purpose of advancing new hypotheses and designing experiments that assume the correctness of the tested hypothesis.

Id.
will continue to test the new claim. 130 The evidentiary reliability of a scientific study is a function of the characteristics of the testing to which that hypothesis has been subjected. 131

C. The Role of Court and Counsel in Establishing Evidentiary Reliability

Justice Blackmun in the Daubert decision tries to help those weighing the reliability of scientific evidence by listing four "general observations" relevant to the inquiry. 132 His list comprises not four parallel reliability considerations, but the one fundamental consideration, testing, followed by three different factors that may be used singly or in combination to measure the rigor of the testing to which a claim has been subjected. These three factors are publication/peer review, statistical rate of study error, and general acceptance by the scientific community of the pertinent discipline. 133 The Court's caveat that this listing is not definitive 134 will be ignored at counsel's peril. A testable claim that cannot establish any of Daubert's listed factors for scientific validity nevertheless may be found to be of sufficient scientific validity to be admissible as evidence. 135 The lack of publication and peer review, the failure of a claim to have yet achieved general consensus, the absence of statistical significance 136 calculations, or even the dearth of all three does not of itself establish that a claim has not been rigorously tested. What it does mean is that a court will have to find other indicators of reliable methodology in order to admit the proffered evidence. 137 Evidentiary relia-

130. See id.
131. For examination of the factors involved in valid scientific method, see, for example, Weinstein & Berger, supra note 111, ¶ 702[03] at 702-41 to 702-42; Black, supra note 20 at 821; Mark McCormick, Scientific Evidence: Defining a New Approach to Admissibility, 67 Iowa L. Rev. 879, 911-12 (1982).
132. See Daubert v. Merrell Dow Pharmaceuticals, Inc., 113 S. Ct. at 2796 ("Many factors will bear on the inquiry, and we do not presume to set out a definitive checklist or test. But some general observations are appropriate.").
133. See id. at 2796-97.
134. Id. at 2796.
135. It is equally important to be aware that the existence per se of any of the Daubert factors does not of itself guarantee the reliability of scientific evidence. General acceptance, for example, has been known on occasion to be a measure of political force rather than scientific reliability. See Z. A. Medvedev, The Rise and Fall of T.D. Lysenko, (I. M. Lerner ed. 1969) (noting that Soviet "scientist" Lysenko's theory that plant and animal traits are determined entirely by environment persisted for decades on the strength of Joseph Stalin's protecting approval).
136. For sources discussing statistical significance see supra note 65.
137. See, e.g., Viterbo v. Dow Chemical Co., 826 F.2d 420 (5th Cir. 1987) (summary judgment affirmed on ground that plaintiff's expert had ignored a test result that revealed high level of another chemical besides the pesticide in question in plaintiff's blood). The court said, "Without more than credentials and a subjective opinion, an expert's testimony that 'it is so' is not admissible." Id. at 924. See also Michael J. Saks & Jonathan J. Koehler, What DNA "Fingerprinting" Can Teach the
bility may be established by the logic, precision, thoroughness, and internal consistency of a study's own test design and data collection or on the strength of other corroborating testing of the scientific hypothesis at issue.\footnote{138}

In summary, laying the foundation for reliability of scientific evidence requires a showing that the claim proffered not only is testable but has been tested, in at least one study, by means that accord with scientific methods.\footnote{139} Under Rule 706, the court may appoint a neutral expert to advise it about the reliability of scientific methodology.\footnote{140} Otherwise the court will rely on preliminary showings in evidentiary hearings to decide if a scientific claim offered in evidence has been sufficiently tested to be considered admissible. This is a matter of law, not a matter of scientific conclusions. The court will decide how much reliability is enough.

It is up to the judge as evidentiary gatekeeper\footnote{141} to decide whether the evidence offered is valid science, appropriately applied, Law About the Rest of Forensic Science, 13 Cardozo L. Rev. 361 (1991).

138. For a thoughtful treatment of reliability analysis focused on the question of whether the claim was tested by recognized forms of scientific practice, see Brief of the Carnegie Commission on Science, Technology, and Government as Amicus Curiae in Support of Neither Party, Daubert v. Merrell Dow Pharmaceuticals, Inc., 113 S. Ct. 2786 (1993) (No. 92-102).

139. See Black, supra note 20, at 642-43 & n.258. See also United States v. Downing, 753 F.2d at 1224, 1238-39 (3d Cir. 1985); McCormick, supra note 131, at 911-12.

140. The relevant text of Federal Rule 706 is virtually identical to Mass. R. Evid. 706:

(a) Appointment.

The court may on its own motion or on the motion of any party enter an order to show cause why expert witnesses should not be appointed, and may request the parties to submit nominations. The court may appoint any expert witnesses agreed upon by the parties, and may appoint expert witnesses of its own selection. An expert witness shall not be appointed by the court unless the witness consents to act. A witness so appointed shall be informed of the witness' duties by the court in writing, a copy of which shall be filed with the clerk, or at a conference in which the parties shall have opportunity to participate. A witness so appointed shall advise the parties of the witness' findings, if any; the witness' deposition may be taken by any party; and the witness may be called to testify by the court or any party. The witness shall be subject to cross-examination by each party, including a party calling the witness.

. . . .

(c) Disclosure of appointment.

In the exercise of its discretion, the court may authorize disclosure to the jury of the fact that the court appointed the expert witness.

(d) Parties' experts of own selection.

Nothing in this rule limits the parties in calling witnesses of their own selection.

Fed. R. Evid. 706.

and therefore admissible.\textsuperscript{142} It is up to counsel to argue convincingly (1) that the testing methodology supporting an offered scientific theory is valid and (2) that the theory is appropriately applied to the facts at issue so as to support the decision the court must make of evidentiary reliability.\textsuperscript{143}\textit{Daubert} and \textit{Williams} correctly require the separation of conclusion from factors underlying the reliability of that conclusion. Both decisions correctly require proponents and opponents of scientific evidence to argue validity of process, not correctness of conclusion, in seeking to establish the court’s confidence in the reliability of that evidence.

The roles for counsel and court as advocate and evaluator of reliability, respectively, follow from an understanding of the nature of science. \textit{Williams} did not before, and \textit{Daubert} will not now, impose any extraordinary new burden on either court or counsel.\textsuperscript{144} Nor do


The reliability of scientific evidence also may be at issue at motions for summary judgment. The court’s confidence in the evidence is reflected in its assessment of weight as well as admissibility. See \textit{supra} notes 59 and 67 and accompanying text for a discussion of reliability confused at admissibility and summary judgment. Whether a scientific claim is challenged as insufficient evidence before, during, or after trial, the court must decide essentially the same issue. The question of a “genuine issue” at motion for summary judgment is very close to the issue at motion for judgment as a matter of law. “In essence, . . . the inquiry under each is the same: whether the evidence presents a sufficient disagreement to require submission to a jury or whether it is so one-sided that one party must prevail as a matter of law.” Anderson v. Liberty Lobby, Inc., 477 U.S. 242, 251-52 (1986).

\textsuperscript{143} Arguing reliability is a role advocates play and courts accept readily in other evidentiary contexts, for example in arguing and weighing the reliability of hearsay.

\textsuperscript{144} In the year since the \textit{Daubert} decision was handed down, the circuit courts of appeal have applied the rules-based admissibility standard for expert evidence in several interesting cases. One of the first was United States v. Bynum, 3 F.3d 769 (4th Cir. 1993), which was pending on appeal when the Supreme Court decided \textit{Daubert}. Bynum had been found guilty of conspiracy and possession of cocaine with intent to distribute. A critical component of the government’s case at trial was the link between Bynum and his co-conspirator. The government called two chemists who testified that the impurities and by-products in the cocaine found on Bynum matched those in cocaine found on the other conspirators. On appeal, Bynum argued that this scientific evidence, based on a new federal/state gas chromatography analysis program, should have been evaluated under the \textit{Frye} rule. \textit{Id.} at 773. The Fourth Circuit held that the trial court had not abused its discretion in admitting the results of the new technology. Defense counsel had offered no evidence to show that gas chromatography is unreliable. The government not only had explained the basis of the underlying science but also had listed the publication of peer-reviewed research results that tested the scientific validity of chromatography analysis. \textit{Id.}

In deciding Cantrell v. GAF Corp., 999 F.2d 1007 (6th Cir. 1993), the appellate court let stand the trial court’s decision under \textit{Daubert} to admit a physician’s testimony for the plaintiffs on the connection between asbestos in the work environment and employees’ laryngeal cancer. The Sixth Circuit cited \textit{Daubert}:

“This entails a preliminary assessment of whether the reasoning or methodology underlying the testimony is scientifically valid and of whether that reasoning or methodology can be applied to the facts in issue.” \textit{Daubert} v.
Williams and Daubert leave juries vulnerable to "junk science." If these precedents demand keener analysis of potentially tangled issues of scientific evidence, so much the better. Arguments will be clearer, and decisions will be stronger.

VI. INSIGHTS DRAWN FROM SELECTED SCIENTIFIC EVIDENCE DECISIONS MADE BY THE MAINE SUPREME JUDICIAL COURT SINCE WILLIAMS

In the years since the 1978 Williams decision did away with general acceptance as an exclusionary rule and identified reliability under Rule 702 as the basis for admissibility of scientific evidence, the Law Court has functionally defined the reliability standard. The Law Court has ruled on several scientific evidence questions, including the reliability and admissibility of applied physics formulas, clinical psychological studies, factors in witness credibility, and

Merrell Dow Pharmaceuticals, Inc., 113 S. Ct. at 2786. In assessing the reliability of particular scientific evidence, the court may, but is not required to, consider the degree of its acceptance in the scientific community. Id. at 1014. Nothing in the rules of evidence or Daubert, said the court, precludes a physician testifying from data gained in his own clinical experience as to the origin of disease. The doctor's testimony could be admitted, and it was for the jury to consider the weight to be given it in light of the testimony of the defendants' own medical expert. Id.

The Second Circuit, hearing on appeal the convictions of John Gotti and Frank Locascio stemming from their involvement with the Gambino crime family of La Cosa Nostra, relied on Daubert, which focused on Rule 702, to emphasize the flexible reach of Rule 703. United States v. Locascio, 6 F.3d 924 (2d Cir. 1993). Defendants argued on appeal that FBI expert testimony aimed at helping the jury understand the structure of organized crime families was inadmissible because it was based on information from "countless nameless informers and countless tapes not in evidence." Id. at 937-38. They argued that under Rule 703, expert opinion testimony is admissible only where the court finds explicitly that underlying inadmissible evidence is trustworthy. The Sixth Circuit rejected the defendants' argument.

The Locascio court ruled that, while Daubert indeed asserts there is no rigid standard for admitting scientific evidence, and a federal court therefore is not required to admit testimony based on questionable data just because it is relied on by others in the field, neither is the district court bound by an explicit trustworthiness requirement for underlying data. "The district court has broad discretion to decide the admissibility of expert testimony based on inadmissible evidence." Id. at 938.


146. State v. Anaya, 438 A.2d 892 (Me. 1981) (expert testimony on battered wife syndrome admitted to support claim of self defense); State v. Black, 537 A.2d 1154 (Me. 1988) (clinical evidence explaining inconsistencies in testimony of sexually abused children admitted, but clinical evidence on behavioral indicators of prior sexual abuse in children excluded); State v. Conlogue, 474 A.2d 167 (Me. 1984) (expert testimony on "battered batterer" syndrome admitted, while expert testimony on behavior of abused children admissible for purpose of explaining behavior but not for purpose of diagnosing prior abuse); State v. Lawrence, 541 A.2d 1291 (Me. 1988) (expert testimony on behavior patterns symptomatic of sexually abused children ex-
medical clinical studies.\textsuperscript{148} Taken as a whole, the Maine cases emphasize that admissibility of scientific evidence is a function not of scientific category but of the court’s confidence in research validity. If federal decisions track the reliability standard as applied by the Maine Law Court’s decisions following Williams, the federal courts will not open undiscriminating arms to proffered scientific evidence. Certain of the Maine scientific evidence cases may give practitioners some insight into Daubert’s application.

A. State v. Lawrence: Temptation to Read What Is Not There

State v. Lawrence,\textsuperscript{149} decided ten years after Williams, illustrates three issues that arise in preparing to argue the admissibility of scientific evidence. First, it is important in analyzing scientific evidence decisions to resist reading into the language of the court more than is there. The Lawrence decision, for example, includes a sentence that, although technically correct, may mislead the reader into believing that in Maine courts, even after Williams, lack of general acceptance is still grounds for excluding scientific evidence. Justice Nichols writes in Lawrence, citing State v. Philbrick: “A significant factor in determining relevance and helpfulness is whether the scientific matters involved in the testimony have been generally accepted or conform to a generally accepted scientific theory.”\textsuperscript{150} Phil-
brick makes clear, however, that this is no withdrawal from Williams and that the transformation of "general acceptance" from an exclusionary standard to a shorthand\textsuperscript{151} ground for admitting scientific evidence still holds. Citing Williams, the Law Court in Philbrick noted:

One of the factors the presiding justice should consider in determining whether proffered testimony will be relevant and helpful to the factfinder is whether the scientific matters involved in the testimony have been generally accepted or conform to a generally accepted scientific theory. "General scientific acceptance" is not a 	extit{sine qua non} of a proposed method of determining facts; however, in order to be admissible the proffered expert testimony must be demonstrated to have 	extit{sufficient reliability} to satisfy the evidentiary requirements of relevance and helpfulness, and of avoidance of prejudice to the defendant or confusion of the factfinder.\textsuperscript{153}

Second, in addition to illustrating the wariness required in reading scientific evidence decisions, Lawrence also underscores that the proponent of scientific evidence may pay a heavy price for failing to lay the necessary foundation establishing that evidence's reliability. Therapists' testimony aimed at establishing that children had been sexually abused was improperly admitted at trial, the Law Court held, because there was a complete absence of evidence on the scientific reliability of the therapists' analytical techniques.\textsuperscript{154} In this case the Law Court vacated a conviction even though the defendant herself had not preserved the error at trial, finding admission of the therapists' testimony without proof of its evidentiary reliability to be obvious error.\textsuperscript{155} Finally, it should not be concluded that because a certain kind of evidence was inadmissible in one case, it will be inadmissible thereafter. The error in Lawrence was not necessarily in the nature of the scientific claim offered but in the failure to establish the validity of the scientific methodology involved.\textsuperscript{156} It is the necessary task of the proponent to find evidence of valid scientific methodology where it exists and to argue the tested validity of the underlying science and hence its reliability as evidence.

\textsuperscript{151} For a discussion of "general acceptance" as shorthand for scientific validity, see 	extit{supra} note 98.

\textsuperscript{152} State v. Philbrick, 436 A.2d at 861 (citations omitted).

\textsuperscript{153} State v. Lawrence, 541 A.2d at 1293.

\textsuperscript{154} Id. at 1292.

\textsuperscript{155} State v. Lawrence, 541 A.2d at 1293 ("There is a complete absence of evidence on the scientific reliability of the therapists' analytical techniques in this case."). By "scientific reliability" the court apparently meant evidentiary reliability, as conferred by scientific validity.
B. State v. Black: Separating Issues of Scientific Reliability from Issues of Witness Credibility, and Excluding Evidence Because of Validity Concerns

*State v. Black* provides another source of insight into scientific evidence admissibility without Frye. *Black* was decided by the Law Court in 1988, ten years after the court rejected the *Frye* exclusionary rule in *Williams*. Nevertheless, the defense in *Black* objected to the testimony of a psychiatric nurse on the express ground that there was no evidence of acceptance in the scientific community on the particular claim at issue. While the objection successfully served to preserve the error for appeal, its raising of “no general acceptance” as grounds for exclusion ignored both *State v. Williams* and the fact that it is possible to establish reliability for a claim in the face of “no acceptance” at all in the scientific community. Beyond that, it is even possible to establish evidentiary reliability for a scientific claim when there has been prior active resistance to that claim in the scientific community. A single, soundly conceived and carefully administered study may serve as a sufficient test to establish a claim as reliable evidence. Opponents of proffered scientific testimony will find no comfort in the rejection of “general acceptance” as a rule of exclusion; proponents aware of the varied means of establishing scientific reliability will.

Using scientific evidence to bolster or attack witness credibility presents a double-layered evidentiary challenge. *Black* raises an important warning to counsel not to tangle analysis of the reliability of scientific evidence with analysis of witness credibility.

156. *State v. Black*, 537 A.2d 1154 (Me. 1988) (conviction of gross sexual misconduct vacated because no demonstration of scientific reliability had been made for testimony about “clinical features” of behavior serving as “indicators” of past abusive trauma to a child).

157. Id. at 1156.

158. *See State v. Anaya*, 438 A.2d 892 (Me. 1981). In this case, the Law Court held that the trial court erred in excluding expert psychological testimony on battered wife syndrome, which was offered to establish self defense in the killing of the defendant’s husband. This is a situation in which scientific study ultimately overcame long resistance, first in the professional psychology community and ultimately in the court, to accepting as possible self defense the killing of a batterer in circumstances other than immediate physical threat.

159. Another Maine case instructive on the often tangled principles of reliability of psychological evidence (governed by Rule 702) and the appropriateness of using that evidence to bolster or to attack the credibility of witnesses (governed by Rules 404 and 608) is *State v. Conlogue*, 474 A.2d 167 (Me. 1984). In *Conlogue*, the Law Court admitted medical testimony of the “battered batterer” syndrome to bolster defendant’s argument that the mother of an abused child, herself battered as a child, was the actual abuser, not he. *Id.* at 172. The dissent of Justice Scolnik and Chief Justice McKusick provides valuable analysis of the principles of reliability of evidence and credibility of witnesses. The dissenting justices would have excluded the testimony not on the grounds that the reliability of the testimony was insufficient to satisfy Rule 702 but because the use of the testimony violated Rule 404, which pro-
of psychology were offered in *Black*; one was admitted in evidence, one was not.160 The first claim was that persons who have suffered from a particular type of trauma may not be able coherently or chronologically to describe their experience. The second was that victims of past sexual abuse can be identified on the basis of currently observed behavior.

Analysis of the admissibility of the psychiatric nurse's testimony on the first claim, which offered a rationale for inconsistencies in the victim's story, requires considering it both as scientific evidence under Rule 702 and in terms of witness credibility under Rules 404 and 608. The victim's credibility had been attacked in cross examination under Rule 404(a)(2), which allows evidence of a witness's character (including character for credibility) to be introduced; defense counsel emphasized inconsistencies in the boy's testimony. In rebuttal under Rule 608(a) the prosecution introduced the nurse's testimony explaining the inconsistent nature of testimony that can occur when a victim of a traumatic experience tries to describe what happened. The Law Court ruled it was within the trial court's discretion to allow the prosecution to present its expert to try to explain those inconsistencies once the defense had extensively cross-examined the boy about the timing and sequence of Black's alleged abuse of him.161 The Law Court did not mention the reliability of the observations and methodology required to support the scientific conclusion offered that trauma itself can be an explanation for an incoherent recounting.

The Law Court in *Black* admitted without discussion of its scientific reliability the nurse's testimony on psychological causes for witness inconsistency. It is impossible to know whether this was because the court considered the underlying methodology of the assertion and found it sufficiently reliable or because the justices simply were accustomed to working with such information and assumed its reliability. Counsel cannot take such acceptance of a category of scientific testimony for granted, however, and must be ready to challenge or to establish if challenged, not only the scientific basis for psychological testimony under Rule 702 but its proper application in bolstering or attacking witness credibility under Rules 404 and 608.162

hibits evidence of a person's character from being admitted for the purpose of showing that that person acted in conformity with such character on a particular occasion. *Id.* at 173-74.


161. *Id.*

162. *See State v. Woodburn*, 559 A.2d 343 (Me. 1989) (clinical psychologist's testimony on whether or not a child alleged to be the victim of abuse could distinguish truth from falsehood held not admissible because of insufficient scientific basis). The decision, decided the year following *Black*, includes a strong dissent in part by Justice Hornby. The analysis of the *Woodburn* dissent is instructive in helping to separate
The Law Court in *Black* was not so easily satisfied, however, that the second psychological claim offered as proof derived from sufficiently valid science. The psychiatric nurse testified that her clinical observations of abused children led her to conclude that certain identifying characteristics were displayed by children who at some time in the past had been sexually abused. The Law Court found this testimony inadequate to establish that the claim was scientifically valid and therefore reliable as evidence. The court explained:

The validity of the summary of symptoms encountered in the population of her patients is seriously impaired by selection bias. No comparison testing was done with children who were not victims of sexual abuse to determine whether they also demonstrated like indicators. Her testimony demonstrates no scientific basis for determining that a causal relationship exists between sexual abuse and the "clinical features of sexual abuse," nor is there demonstrated even a positive correlation between the two.\(^{163}\)

It would remain to be seen, of course, whether the Law Court would have found psychological testimony reliable for identifying characteristics of sexually abused children if evidence had been presented that the nurse's clinical observations were carried out in a different way. Although her conclusion might be exactly the same after a differently structured clinical study, admissibility would turn on the strength of that differently formulated inquiry. Predictions of admissibility cannot be based single-mindedly on supposed patterns of admissible "categories" of science. Conventional wisdom as to which "kinds" of science will be admitted into evidence can be defeated by an upstart study, well planned, well performed, and well documented, that casts aside past inadequacies of research into a particular scientific claim.\(^{164}\)

\(^{163}\) State v. Black, 537 A.2d at 1157.

\(^{164}\) There are, of course, many scientific claims that have survived thorough and severe testing and earned such confidence that their theories are appropriate subjects of judicial notice, e.g., radar, x-ray technology, blood typing, bullet identification by tool mark. However, previous admission of a scientific theory or claim may not necessarily confer admissibility forever after. Lists of courts' reactions to scientific claims based on underlying testing methodology and admissibility standards at the time of the decision can be found in annotations. See, e.g., Debra T. Landis, Annotation, When Will Expert Testimony "Assist Trier of Fact" So As To Be Admissible at Federal Trial Under Rule 702 of Federal Rules of Evidence, 75 A.L.R. Fed. 461 (1985); Daniel A. Klein, Annotation, Reliability of Scientific Technique and Its Acceptance Within Scientific Community As Affecting Admissibility, at Federal Trial, of Expert Testimony As To Result of Test or Study Based on Such Technique—Modern Cases, 105 A.L.R. Fed. 299 (1991). Sound research methodology can
C. State v. York: Claims within Certain Categories of Scientific Evidence May Require Substantial Evidentiary Foundation

Comparison of the Law Court's majority opinion in State v. York with the dissent raised by Justice Hornby and Chief Justice McKusick illustrates the task faced by the court as it tries to establish where confidence should lie in treating scientific evidence. The two dissenting justices would place more confidence than the majority in the offered claim that current behavioral characteristics can be used to identify past sexual abuse. Although the State had argued that use of clinically observed behavior was generally accepted in the profession of psychology to identify victims of child abuse, the court remained unconvinced of the scientific validity of the witness's offered conclusions. Behavioral symptoms of sexual abuse might be reliable enough for use in psychological treatment. Still, with only this much evidence offered of the scientific testing underlying the claim, the court ruled these conclusions of sexual abuse, based on clinical observation of behavior, insufficiently reliable to be admitted in evidence. General acceptance of a scientific claim within a particular discipline is not necessarily a ticket to admissibility.

The question of the validity of the science underlying the claimed relationship between clinically observed behavior and abuse is a difficult one. Justice Hornby wrote in dissent in York, "I resist the suggestion that clinical evidence is somehow inherently inadequate. Trial courts routinely accept clinical testimony from medical physicians concerning such matters as the onset and development of a disease. I am not aware that all such testimony carries with it solid empirical research beyond the clinical experience." For practitioners, Justice Hornby continued to raise a flag of warning; building a case for the admission of certain scientific evidence, particularly clinical psychology, may require especially thorough foundation work.

What seems to be happening here is that, wittingly or not, appellate courts are in the process of carving out a separate and tougher evidentiary rule for expert testimony in areas where they are skeptical of the science—clinical social work, perhaps the psychology

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165. 564 A.2d 389 (Me. 1989) The York decision is complicated by the fact that counsel did not object to the admission of the expert scientific testimony at trial; the Law Court found the testimony inadmissible on appeal based on obvious error analysis.

166. Id. at 390.

167. Id. ("Deveau testified that within her profession there are recognizable characteristics of the sexually abused child . . . .").

168. Id. at 392.
profession or even the social sciences generally.\textsuperscript{169}

It behooves a proponent of such evidence to take care to establish as fully as possible the validity of the scientific methodology on which proffered clinical evidence is based.\textsuperscript{170}

D. State v. Boutilier: Reliable Science Excludable When Unreliably Applied

\textit{State v. Boutilier}\textsuperscript{171} illustrates how reliable scientific theory can be denied admission because it is unreliably applied.\textsuperscript{172} Boutilier was the driver of a car that missed a curve and crashed, injuring a passenger who later died of his injuries. A state trooper testified at Boutilier's trial as to the speed the car was travelling when it failed to negotiate the curve, reconstructing the velocity of the car from tire marks left on the pavement. His testimony was the only available evidence of the car's speed. The Law Court declined to find the trooper unqualified as an expert, though he had had only one year of college and three weeks of accident investigation training. Such qualifications as an expert left "a great deal to be desired,"\textsuperscript{173} according to the court, but the court would not take it upon itself to overturn the decision as to expertise made at the trial court's discretion.\textsuperscript{174}

What the Law Court would not accept, however, was the reliability of the scientific speed analysis testimony the trooper presented. He used a valid and well-tested formula, a sufficiently reliable scientific theory, but the wrong theory for the facts. The voir dire disclosed that the trooper had arrived at his opinion of a precise range of speed at which the defendant's car had been travelling by using a formula developed to reveal the theoretical speed tolerance of a curved roadway rather than the actual speed of a car that failed to negotiate a curve.\textsuperscript{175}

Admissibility of scientific evidence requires at a minimum: (1) a

\begin{itemize}
  \item \textsuperscript{169} Id. at 393.
  \item \textsuperscript{170} Justice Hornby adds an important aside in the form of a footnote in \textit{York}, given that most scientific evidence appeals in Maine have arisen in criminal cases. "I do not see," he says, "how we can distinguish criminal from civil trials; the relevant evidentiary rules are unified. Although the burden of proof obviously differs, that does not affect the threshold question of admissibility." \textit{Id.} at 392 n.2.
  \item \textsuperscript{171} 426 A.2d 876 (Me. 1981).
  \item \textsuperscript{172} \textit{See supra} note 118 and accompanying text.
  \item \textsuperscript{173} \textit{Id.} at 878.
  \item \textsuperscript{174} \textit{Id.} ("It is evident to us from the voir dire in this case that Trooper Joseph's training and experience leave a great deal to be desired. Yet, we would hesitate to overturn the ruling of the presiding justice, which involves a large measure of discretion, solely for that reason.") Qualification as an expert is a fundamental component of the foundation required for admitting scientific evidence under both ME. R. Evid. 702 and FED. R. Evid. 702.
  \item \textsuperscript{175} \textit{Id.} at 878-79.
\end{itemize}
qualified expert, (2) testifying to a theory whose reliability has been established by sufficient scientific testing, (3) applied correctly to the facts of the case. In this case the misapplication of a sound theory resulted in the whole of the offered “scientific” evidence being found unreliable and inadmissible. Boutilier’s conviction for manslaughter was set aside.176

E. State v. LeBlanc: Minimal Reliability and Exclusion Under Rule 403

State v. LeBlanc177 would be an intriguing case for the creativity of the defense alone. However, it also serves to illustrate both the functional minimum of validity that can support admissibility of scientific evidence and the use of alternative grounds for excluding evidence. In LeBlanc, the trial court had refused to admit medical testimony purporting to establish that Mr. LeBlanc was subject to “polysystemic candidiasis,” an overgrowth of yeast organisms in the systems and organs of the body whose microtoxins allegedly caused LeBlanc to become confused and disoriented, in which state he entered a woman’s bedroom and assaulted her.178 The defense claimed that such confusion established that the defendant did not have the capacity to form the requisite criminal intent. Among the State’s arguments on appeal was the apparently imperishable objection (eleven years had passed since State v. Williams had declared lack of “general acceptance” no longer the standard for exclusion of scientific evidence) that the trial court’s exclusion of this evidence was proper because the candidiasis theory lacked general scientific acceptance.179

Justice Roberts, writing for the Law Court, disposed gently once more of the “lack of general acceptance” exclusion argument Williams had rejected. The Law Court would adhere to its determination in State v. Williams that general scientific acceptance is not a prerequisite for the admission of scientific testimony.180 Furthermore, the Law Court found, this novel medical theory, offered by a general surgeon, had “some” relevance.181

The scientific claim of the effects of candidiasis was sufficiently valid to pass the minimal reliability test of Rule 702 for admission in evidence. That was not to say the court would admit it, however. Reliability sufficient for relevancy, sufficient for assisting the factfinder, is not necessarily reliability sufficient to confer probative value that can outweigh the danger of delay and confusion to the

176. Id. at 880.
177. 559 A.2d 349 (Me. 1989).
178. Id. at 351.
179. Id.
180. Id.
181. Id.
satisfaction of Rule 403.\textsuperscript{182}

The doctor, in his offer of proof, stated that the yeast microtoxins with which he had diagnosed LeBlanc had an effect on individuals that was somewhat unpredictable. He added that their effect when combined with alcohol was not really predictable.\textsuperscript{183} The Law Court accepted as scientifically valid the doctor's work in arriving at his diagnostic theory, but at the same time the Law Court affirmed the trial court's exclusion of this doctor's testimony. In finding the weight of the evidence insufficient, the court said, "We conclude, therefore, that [the doctor's] diagnosis of polysystemic candidiasis, even if accepted as reliable, had minimal probative value in advancing LeBlanc's defense. We find no reversible error in the court's conclusion that the obvious danger of delay and confusion [of issues] outweighed that minimal probative value."\textsuperscript{184}

VII. CONCLUSION

The 1993 United States Supreme Court decision in \textit{Daubert v. Merrell Dow}, which parallels the 1978 Maine Law Court decision in \textit{State v. Williams}, will wreak no generalized havoc in admissibility of scientific evidence in federal courts. As in Maine courts since \textit{Williams}, the Frye standard of "general acceptance in the scientific community" is no longer available as an exclusionary tool, although it lingers as a potential shorthand means for arguing the validity and admissibility of scientific evidence. Admissibility of scientific evidence in federal courts will turn now on the reliability of that evidence, with reliability a function of the validity of research underlying the scientific conclusions offered. The locus of this reliability requirement in both Maine and federal courts is Rule of Evidence 702.

Issues of scientific evidence admissibility lend themselves to confusion. The several evidence rules\textsuperscript{185} in addition to Rule 702 that can be called upon to exclude scientific evidence are not always clearly explicated in court decisions. The temptation to find relief from decisions of uncertain analysis in a mantra that classifies "types" of science as admissible or inadmissible exposes counsel to the risk of facing unarmed an informed opposing argument grounded in the doctrine of evidentiary reliability. Maine case law since \textit{Williams}, read with an eye to the scientific validity, relevance, and probative

\begin{footnotesize}
\begin{itemize}
\item \textsuperscript{182} See \textit{supra} note 116.
\item \textsuperscript{183} \textit{State v. LeBlanc}, 559 A.2d at 352.
\item \textsuperscript{184} \textit{Id.} (citation omitted).
\item \textsuperscript{185} Scientific evidence can be excluded as irrelevant (Rule 402), because the facts to which a proffered theory applies are not of a category typically relied upon (Rule 703); because use of scientific evidence has been used inappropriately to attack or bolster witness credibility (Rules 404 and 608); or because the scientific evidence's probative value is insufficient to outweigh the unfair prejudice it induces (Rule 403).
\end{itemize}
\end{footnotesize}
issues underlying the reliability standard, can provide guidance for arguing admissibility of scientific evidence in both Maine and post-
*Daubert* federal courts.

Like the Law Court in *Williams* before it, the Supreme Court in *Daubert* correctly comprehended the fundamental nature of science and requires those who hope to introduce evidence they would classify as science to understand as well. The need to make evidentiary admissibility decisions for expert scientific testimony does not require that every judge become a scientist. Courts must bring to questions of scientific evidence admissibility a general understanding of scientific methodologies, those common processes of mind and technique by which hypotheses in all the disciplines of science are tested. Counsel must provide a similar understanding of scientific methodology to substantiate argument that such scientific testing has, or has not, been used to arrive at the claim proffered. Counsel must also be prepared to argue that the proffered scientific evidence is or is not properly applied to the case at hand. Abbreviated attempts to categorize claims as admissible by category will fail before the understanding that there is no hierarchy of “good” or “bad” science but only conclusions reached either by the methods of science or not.

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