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BY ROBERT F. BLOMQQUIST*

Expert opinion ... is only an ordinary guess in evening clothes ... .

INTRODUCTION

In *Daubert v. Merrell Dow Pharmaceuticals,* the Supreme Court of the United States—Justice Blackmun speaking for everyone but Chief Justice Rehnquist and Associate Justice Stevens—held that the “general acceptance” test of *Frye v. United States* was superseded by the adoption of the Federal Rules of Evidence in 1975. In the course of ruling on the question presented—the appropriate “standard for admitting expert scientific testimony in a federal trial”—the Blackmun opinion...

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3 Justices Rehnquist and Stevens concurred in part and dissented in part. The Justices joined in Parts I and II-A of the opinion, as well as the Court’s holding that “the *Frye* rule did not survive the enactment of the Federal Rules of Evidence . . . .” *Id.* at 2799 (Rehnquist, C.J., concurring in part and dissenting in part). They dissented, however, from what they viewed as the Court’s engaging in construction of “Rules 702 and 703 very much in the abstract [while] . . . offer[ing] some ‘general observations’” about scientific expert testimony. *Id.*

4 293 F. 1013, 1014 (1923).

5 *Daubert,* 113 S. Ct. at 2791.

6 Justice Blackmun may have enjoyed the intellectual challenge of the *Daubert* case in light of his undergraduate major of mathematics at Harvard. See *The Oxford Companion to the Supreme Court of the United States* 75-77 (Kermit L. Hall et al. eds., 1992) [hereinafter *Oxford Companion*]. Moreover, “[h]is early interest in
indulged in "some general observations" concerning the "[m]any factors [that] will bear on the inquiry" of whether or not a federal trial court judge should accept or reject a proffer of expert testimony.

The broad contours of Justice Blackmun's opinion for the Court are relatively straightforward:

1. Frye's test, whereby an expert opinion based on a scientific technique is inadmissible unless the technique is "generally accepted" as reliable in the relevant scientific community, was superseded by the adoption of the Federal Rules of Evidence (the "Rules").

2. The Rules occupy the field. Although the common law of evidence may serve as an aid to the application of the Rules, the common law never assimilated Frye into the general structure of the Rules.

3. Neither the Rules as a whole nor the text and legislative history of Rule 702, which specifically governs expert testimony, gives any indication that "general acceptance" is a necessary condition precedent to the admissibility of scientific evidence.

Justice Blackmun's judicial philosophy has undergone considerable evolution during his many years on the Supreme Court.

The "third man" after the defeated nominations of Justice Clement Haynsworth and G. Harold Carswell, Blackmun was appointed to the Supreme Court by President Richard Nixon. He was at the time a little-known federal judge, and it was thought he would bring to the Court the same values as his friend Chief Justice Warren E. Burger, playing his part in Nixon's effort to reorient the Court in a conservative ideological direction. Initially, Blackmun's voting was quite close to Burger's—something Burger may have taken for granted—and they were sometimes referred to as the "Minnesota Twins." He was quiet, even diffident, and a slow writer, which limited his influence within the Court. As he became more sure of himself, however, he moved away from Burger toward the liberal end of the Court, becoming outspoken and explicit in his efforts to keep an increasingly conservative Court on center.

Justice Blackmun's best-known opinions for the Court are his abortion opinions. See Doe v. Bolton, 410 U.S. 179 (1973); Roe v. Wade, 410 U.S. 113 (1973). He also wrote for the Court in Garcia v. San Antonio Metro. Transit Auth., 469 U.S. 528 (1985), holding that local governments are subject to minimum wage requirements.

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7 Daubert, 113 S. Ct. at 2796.
8 Id.
9 Id.
10 Id. at 2793-94.
11 Id. at 2794.
12 Id.
4. Judicial imposition of the rigid "general acceptance" test would be contrary to the Rules' liberal thrust and their general approach of removing barriers to "opinion testimony."\(^{13}\)

5. Rule 702, among other provisions of the Rules, provides proper limits on the admissibility of scientific evidence by entrusting the trial court with a twofold gatekeeping function: (a) to determine that an expert's testimony is based on a reliable foundation\(^{14}\) and (b) to ascertain that the expert's testimony is relevant to the issue at bar.\(^{15}\)

\(^{13}\) Id. The Court ended Part II-A of its opinion by observing:

Because we hold that Frye has been superseded and base the discussion that follows on the content of the congressionally-enacted Federal Rules of Evidence, we do not address petitioners' argument that application of the Frye rule in this diversity case, as the application of a judge-made rule affecting substantive rights, would violate the doctrine of Erie R. Co. v. Tompkins, 304 U.S. 64 . . . (1938).

\(^{14}\) Daubert, 113 S. Ct. at 2794 n.6.

\(^{15}\) Daubert, 113 S. Ct. at 2795. In the course of reaching this conclusion, the Court relied extensively on amicus curiae briefs submitted in the case. The Court reasoned as follows:

The primary locus of [a trial court judge's evidentiary] obligation is Rule 702, which clearly contemplates some degree of regulation of the subjects and theories about which an expert may testify. "If scientific, technical, or other specialized knowledge will assist the trier of fact to understand the evidence or to determine a fact in issue" an expert "may testify thereto." The subject of an expert's testimony must be "scientific . . . knowledge." The adjective "scientific" implies a grounding in the methods and procedures of science. Similarly, the word "knowledge" connotes more than subjective belief or unsupported speculation. The term "applies to any body of known facts or to any body of ideas inferred from such facts or accepted as truths on good grounds." Webster's Third New Int'l. Dictionary 1252 (1986). Of course, it would be unreasonable to conclude that the subject of scientific testimony must be "known" to a certainty; arguably, there are no certainties in science. See, e.g., Brief for Nicolaas Bloembergen et al. as Amici Curiae 9 ("Indeed, scientists do not assert that they know what is immutably 'true'--they are committed to searching for new, temporary theories to explain, as best they can, phenomena"); Brief for American Association for the Advancement of Science and the National Academy of Sciences as Amici Curiae 7-8 ("Science is not an encyclopedic body of knowledge about the universe. Instead, it represents a process for proposing and refining theoretical explanations about the world that are subject to further testing and refinement") (emphasis in original). But, in order to qualify as "scientific knowledge," an inference or assertion must be derived by the scientific method. Proposed testimony must be supported by appropriate validation--i.e., "good grounds," based on what is known. In short, the requirement that an expert's testimony pertain to "scientific knowledge" establishes a standard of evidentiary reliability.

\(^{15}\) Daubert, 113 S. Ct. at 2795 (footnotes omitted).
6. In carrying out his or her evidentiary responsibilities under Rule 702, the trial judge faced with a proffer of scientific testimony should first undertake a preliminary assessment of whether the expert’s underlying reasoning or methodology is scientifically valid and relevant. A variety of factors may influence the trial judge’s inquiry, including, but not limited to, the following: (a) whether the theory or technique in question “can be (and has been) tested”; (b) whether it has been peer relevance for admissibility of scientific evidence, the Court provided an interesting example:

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. . . . The consideration has been aptly described . . . as one of “fit.” . . . “Fit” is not always obvious, and scientific validity for one purpose is not necessarily scientific validity for other, unrelated purposes. . . . The study of the phases of the moon, for example, may provide valid scientific “knowledge” about whether a certain night was dark, and if darkness is a fact in issue, the knowledge will assist the trier of fact. However (absent creditable grounds supporting such a link), evidence that the moon was full on a certain night will not assist the trier of fact in determining whether an individual was unusually likely to have behaved irrationally on that night. Rule 702’s “helpfulness” standard requires a valid scientific connection to the pertinent inquiry as a precondition to admissibility.

Id. at 2795-96 (citations omitted).

16 Id. at 2796. Rule 104(a), which requires this preliminary inquiry by the trial court judge, provides:

“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) [pertaining to conditional admissions]. In making its determination it is not bound by the rules of evidence except those with respect to privileges.”

Id. n.10 (quoting FED. R. EVID. 104(a)).

17 Id. at 2796. “We are confident that federal judges possess the capacity to undertake this review. 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.” Id. (emphasis added).

18 Id. Relying upon a variety of scholarly secondary sources to justify this factor, the Court noted that “[s]cientific methodology today is based on generating hypotheses and testing them to see if they can be falsified; indeed, this methodology is what distinguishes science from other fields of human inquiry.” Id. (quoting Michael D. Green, Expert Witnesses and Sufficiency of Evidence in Toxic Substances Litigation: The Legacy of Agent Orange and Bendectin Litigation, 86 NW. U. L. REV. 643, 645 (1992)). The Court also recognized that “the statements constituting a scientific explanation must be capable of empirical test,” id. at 2797 (quoting CARL G. HEMPEL, PHILOSOPHY OF NATURAL SCIENCE 49 (1966)), and that “the criterion of the scientific status of a theory is its
reviewed and published;¹⁹ (c) the known or potential error rate if a particular scientific technique is utilized,²⁰ (d) "the existence and maintenance of standards controlling [the theory's] operation",²¹ and (e) whether the expert's opinion has attracted widespread acceptance within a relevant scientific community.²²

7. The Rule 702 inquiry, mandated by the Court, is 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 the inquiry, however] must be solely on principles and methodology, not on the conclusions that they generate."²³

falsifiability, or refutability, or testability." Id. (quoting Sir Karl R. Popper, Conjectures and Refutations: The Growth of Scientific Knowledge 37 (5th ed. 1989)).

¹⁹ Daubert, 113 S. Ct. at 2797. Again, the Court relied upon several scholarly secondary sources to validate this factor:

Publication (which is but one element of peer review) is not a sine qua non of admissibility; it does not necessarily correlate with reliability, . . . and in some instances well-grounded but innovative theories will not have been published . . . . Some propositions, moreover, are too particular, too new, or of too limited interest to be published. But submission to the scrutiny of the scientific community is a component of "good science," in part because it increases the likelihood that substantive flaws in methodology will be detected. The fact of publication (or lack thereof) in a peer-reviewed journal thus will be a relevant, though not dispositive, consideration in assessing the scientific validity of a particular technique or methodology on which an opinion is premised.

Id. (citations omitted).

²⁰ Id. (citing United States v. Smith, 869 F.2d 348, 353-54 (7th Cir. 1989)).

²¹ Id. (citing United States v. Williams, 583 F.2d 1194, 1198 (2d Cir. 1978), cert. denied, 439 U.S. 1117 (1979)).

²² Id. The Court noted:

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." Widespread acceptance can be an important factor in ruling particular evidence admissible, and "a known technique that has been able to attract only minimal support within the community" may properly be viewed with skepticism.

Id. (citations omitted).

²³ Id. Observing that a number of judicial and scholarly authorities had previously "presented variations on the reliability approach, each with its own slightly different set of factors," id. n.12, the Court acknowledged that to the extent that these other authorities "focus on the reliability of evidence as ensured by the scientific validity of its underlying principles, all these versions may well have merit, although we express no opinion regarding any of their particular details." Id.
8. Other applicable Rules such as Rules 703, 706, and 403 may impact "a proffer of expert scientific testimony under Rule 702" and should be carefully considered by a trial court judge.

9. Rather than seeking strict exclusion of evidence under the rigid Frye "general acceptance" standard, an advocate seeking to challenge reliable and relevant scientific evidence can utilize a host of other, less restrictive trial techniques including "cross-examination, presentation of contrary evidence, and careful instruction on the burden of proof." On the other hand, the risk that limited judicial screening, mandated by the Court under Rule 702, may "on occasion ... prevent the jury from learning of authentic insights and innovations. ... [is a result of] the balance that is struck by Rules of Evidence designed not for the exhaustive search for cosmic understanding, but for the particularized resolution of legal disputes."

I. REHNQUIST'S CRITICISMS

The opinion by Chief Justice William Rehnquist, concurring in part and dissenting in part, made a number of trenchant criticisms of the majority opinion. While joining in Part I and Part II-A of the Court's

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24 "Rule 703 provides that expert opinions based on otherwise inadmissible hearsay are to be admitted only if the facts or data are "of a type reasonably relied upon by experts in the particular field in forming opinions or inferences upon the subject."" Id. at 2797-98 (quoting FED. R. EVID. 703).

25 "Rule 706 allows the court at its discretion to procure the assistance of an expert of its own choosing." Id. at 2798.

26 "Rule 403 permits the exclusion of relevant evidence "if its probative value is substantially outweighed by the danger of unfair prejudice, confusion of the issues, or misleading the jury."" Id. (quoting FED. R. EVID. 403). The Court further explained that since expert testimony tends to be misleading because of the difficulty in discerning its meaning and efficacy and tends to be powerful in its impact on the factfinder, the trial court should exercise more control over expert witnesses than over lay witnesses in counterbalancing possible prejudice with probative force. Id.

27 Id. at 2797.

28 Id. at 2798.

29 Id. at 2798-99. In an intriguing philosophical footnote to the quoted assertion in the text, the Court observed:

This is not to say that judicial interpretation, as opposed to adjudicative factfinding, does not share basic characteristics of the scientific endeavor: "The work of a judge is in one sense enduring and in another ephemeral. ... In the endless process of testing and retesting, there is a constant rejection of the dross and a constant retention of whatever is pure and sound and fine."

Id. at 2799 n.13 (quoting BENJAMIN N. CARDOZO, THE NATURE OF THE JUDICIAL PROCESS 178, 179 (1921)).
opinion, which held that the Frye rule did not survive the promulgation of the Rules, the Chief Justice contended that the further question presented in the petition for certiorari was mooted. Accordingly, he stated his overarching objection to the Court's "proceed[ing] to construe Rules 702 and 703 very much in the abstract, and ... [to the Court's] offer[ing of] some 'general observations'". As Rehnquist pointed out:

"General observations" by this Court customarily carry great weight with lower federal courts, but the ones offered here suffer from the flaw common to most such observations—they are not applied to deciding whether or not particular testimony was or was not admissible, and therefore they tend to be not only general, but vague and abstract. This is particularly unfortunate in a case such as this, where the ultimate legal question depends on an appreciation of one or more bodies of knowledge not judicially noticeable, and subject to different interpretations in the briefs of the parties and their amici.

In this regard, the Chief Justice was alarmed by the number of amicus briefs filed in the case and by the reliance that the Daubert Court placed on the "amicus briefs and other secondary sources." Rehnquist contended that his concern was justified:

The various briefs filed in this case are markedly different from typical briefs, in that large parts of them do not deal with decided cases or statutory language—the sort of material [that the Supreme Court] customarily interpret[s]. Instead, [the amicus briefs] deal with definitions of scientific knowledge, scientific method, scientific validity, and peer review—in short, matters far afield from the expertise of judges. This is not to say that such materials are not useful or even necessary in deciding how Rule 703 should be applied; but it is to say that the unusual subject matter should cause us to proceed with great caution in deciding more than we have to, because our reach can so easily exceed our grasp.

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30 Daubert v. Merrell Dow Pharmaceuticals, Inc., 113 S. Ct. 2786, 2799 (1993) (Rehnquist, C.J., concurring in part and dissenting in part). According to Rehnquist, the mooted question was "if Frye remains valid, whether it requires expert scientific testimony to have been subjected to a peer-review process in order to be admissible." Id.

31 Id. (quoting Blackmun's majority opinion, id. at 2796).

32 Id.

33 Id. "Twenty-two amicus briefs have been filed in the case, and indeed the Court's opinion contains no less than 37 citations to amicus briefs and other secondary sources." Id.

34 Id. (emphasis added).
Assuming arguendo that it "were desirable to make 'general observations' not necessary to decide the questions presented," Chief Justice Rehnquist utilized the remainder of his opinion to sketch three specific disagreements with certain observations made by the Daubert Court. First, he disputed the Court's conclusion that "reliability" is a touchstone for admissibility of expert testimony. Contrary to the specific language of Rule 402 regarding relevancy, Chief Justice Rehnquist opined that "there is no similar reference in the Rule to 'reliability.'" Second, Rehnquist disputed the Court's linkage of "evidentiary reliability" with "scientific validity." In his view, the Court's reasoning on this point was tortuous and unconvincing because:

[i]he Court constructs its argument by parsing the language "'[i]f scientific, technical, or other specialized knowledge will assist the trier of fact to understand the evidence or to determine a fact in issue . . . an expert . . . may testify thereto. . . .' Fed. Rule Evid. 702. It stresses that the subject of the expert's testimony must be "scientific . . . knowledge," and points out that "scientific" "implies a grounding in the methods and procedures of science," and that the word "knowledge" "connotes more than subjective belief or unsupported speculation." From this it concludes that "scientific knowledge" must be "derived by the scientific method." Proposed testimony, we are told, must be supported by "appropriate validation." Indeed, in footnote 9, the Court decides that "[i]n a case involving scientific evidence, evidentiary reliability will be based upon scientific validity."

In discussing his divergence of opinion with the Court's dicta that "evidentiary reliability" is a key factor bearing on the admissibility of expert scientific testimony—with reliability being a function of "scientific validity"—the Chief Justice raised a variety of interesting and perplexing epistemological issues: (a) "Does all of this dicta apply to an expert seeking to testify on the basis of 'technical or other specialized knowledge'—the other types of expert knowledge to which Rule 702 applies—or are the 'general observations' limited only to 'scientific knowledge'?"; (b) "What is the difference

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35 Id. at 2799-800.
36 Id. at 2800 (quoting the majority opinion, id. at 2794-95). The other touchstone of admissibility of expert testimony mentioned by the Daubert majority, one which the Chief Justice did not dispute, is "relevancy." Id.
37 Id.
38 Id.
39 Id. (citations omitted).
40 Id.
between scientific knowledge and technical knowledge?"; 41 (c) "Does Rule 702 actually contemplate that the phrase 'scientific, technical, or other specialized knowledge' be broken down into numerous subspecies of expertise, or did its authors simply pick general descriptive language concerning the sort of expert testimony which courts have customarily received?"; 42 and (d) Is the question of whether a phenomenon has been or can be empirically "tested" akin to, in the words of the Daubert Court, a scientific theory's "falsifiability, or refutability, or testability," 43 or to something else? 44

Chief Justice Rehnquist's final specific disagreement with Daubert was his perception of a more limited role for federal trial court judges than that posited by the majority. While Rehnquist did "not doubt that Rule 702 confides to the judge some gatekeeping responsibility in deciding questions of the admissibility of proffered expert testimony... . . ., [he did] not think it imposes on them either the obligation or the authority to become amateur scientists in order to perform that role." 45

II. DAUBERT'S BROAD IMPLICATIONS

Let us be mindful of what is implicated by Daubert: admitting or excluding expert scientific opinion in a federal civil trial is often the difference between victory, defeat, and survival in the underlying litigation. 46 Indeed, the petitioners in Daubert—two minor children and their respective parents—were defeated in pursuing their tort claims for the children's serious birth defects allegedly caused by their mother's prenatal ingestion of the prescription drug Bendectin, because the lower courts

41 Id.
42 Id.
43 Id. (quoting the majority opinion, id. at 2796-97).
44 Id. On this issue, Chief Justice Rehnquist observed: "I defer to no one in my confidence in federal judges; but I am at a loss to know what is meant when it is said that the scientific status of a theory depends on its 'falsifiability,' and I suspect some of them will be, too." Id.
45 Id. "I think the Court would be far better advised in this case to decide only the questions presented, and to leave the further development of this important area of the law to future cases." Id.
46 At the very least, whether expert scientific testimony is admissible often is the difference between a plaintiff surviving a defendant's dispositive motion, and being able to proceed to trial, or losing the motion and being dismissed from the case. See, e.g., Merrell Dow Urges Ninth Circuit to Affirm Defense Summary Judgment in 'Daubert' Case, 8 Toxics L. Rep. (BNA) 396 (Sept. 8, 1993).
excluded the affidavits of eight well-qualified experts. Petitioners' experts had sought to respond to Merrell Dow's motion for summary judgment, which relied upon several affidavits in which experts stated that no published scientific literature had demonstrated that maternal use of Bendectin was a risk factor for human birth defects. The petitioners' experts had prepared affidavits that averred, contrary to Merrell Dow's assertions, that Bendectin can cause birth defects. Petitioners' experts had based their excluded opinions on animal studies, chemical structure analyses, and the unpublished "reanalysis" of previously published human statistical studies.47

Scientific evidence is particularly critical to the outcomes of the avalanche of toxic tort cases, including the Daubert case, that have been filed during the last fifteen years.48 Indeed, toxic tort actions typically involve plaintiffs who claim "actual or potential physical injuries, emotional distress, property damages, and economic losses, which were caused by substances in the air, ground, and water."49 Accordingly, toxic tort disputes have tended to be subsumed by and preoccupied with the issue of toxicity: "the capacity of a chemical to produce injury or harm"50 to human beings or their property. Determining toxicity, in turn, involves intricate and convoluted mixed questions of fact and law. In


contrast to the traditional tort case, which involves relatively simple issues of fact and law, toxic tort litigation usually involves a "fundamentally different" level of complexity.\(^{51}\)

In the face of traditional principles of tort law, such as burden of proof and proximate causation, proving liability and damages in toxic tort are often daunting tasks for plaintiffs and their attorneys. As Professor Peter Schuck eloquently observed in his book on the complexities of the Agent Orange litigation:

In the traditional tort case, the nature of the injury is typically rather straightforward: an actual assault, physical collision, trespass on land, defamatory statement, act of professional malpractice, or other relatively determinate, well-defined, traumatic interaction between the injurer and victim. Of course, difficult issues often arise even in conventional tort cases concerning who did what to whom, when, and with what effect. But these difficulties can usually be addressed more or less routinely. And when they cannot be, the putative victim is unlikely to pursue the claim, if only because most personal injury lawyers—who typically prosecute such claims only on a contingency fee basis (under which they are paid a percentage of any recovery) rather than an hourly rate basis—will not accept the case.

In the toxic tort dispute, the nature of the injury is very different and the processes of establishing, defining, and measuring that injury are far more complex. A chemical agent (or, less commonly, ionizing radiation) is suspected of having harmed one or more individuals. Often the pathways of causation are difficult to detect, the time periods extend over decades, and the effects are not readily isolated or scientifically understood. In some cases the victims may not even know that they have been harmed or that their harm is associated with a particular agent. Indeed, the victims may even be impossible to identify! In other cases the identity of the particular injurers may be unknown, and even if known, it may be impossible, either in principle or in practice, to accurately allocate responsibility for the harm among them.

These extraordinary difficulties in toxic tort cases—the problems of so-called indeterminate plaintiffs and indeterminate defendants—usually

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reflect not only the high cost of establishing certain facts, but also the limited ability of existing scientific theory and methodology to establish these facts at any price. This problem in turn may actually reflect a more elementary epistemological uncertainty concerning what we mean by a "fact" in the peculiar social-scientific context from which toxic torts arise.

The distinctive character of a toxic tort fundamentally affects the nature and course of the litigation. Entirely different forms of proof, demanding new kinds of evidence and witnesses, are usually necessary. Different rules of procedures, evidence, and substantive law may be required. And if implemented, these new legal arrangements inevitably alter the rules and relationships of litigants, lawyers, trial judges, juries, appellate judges, research institutions, regulatory agencies, and other governmental organs in profound ways.\(^3\)

During the last decade, the challenges and intricacies of proving toxic causation and the empirical and normative roles that experts play in

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\(^3\) Peter H. Schuck, Agent Orange on Trial: Mass Toxic Disasters in the Courts 8-9 (1986) (footnotes omitted). Indeed, [toxic tort plaintiffs face serious obstacles in establishing the presence of one or more injury-causing substances, exposure, and injury resulting from exposure. An initial difficulty is that in most cases the precise measurement of routes and amounts of exposure is difficult because of the random and ad hoc nature of individual toxic tort injuries. Second, long latency periods between exposure and resulting injury present further difficulties which may lead to the barring of a cause of action because the limitations period has expired. Third, while a plaintiff may suffer some injury or disease from an antecedent toxic exposure, traditional rules against claim splitting may impede a plaintiff’s ability to reopen the case in the future or to file a second claim based on injuries that become manifest several years later. A fourth causation problem facing toxic tort plaintiffs is isolation of the particular disease or ailment with the claimed toxic exposure; given the traditional long latency period of toxic diseases between exposure and manifestation, a plaintiff is likely to encounter defense arguments that contend that many factors—environmental and lifestyle—may combine to produce an illness. Fifth, even if plaintiffs can muster strong proof to link the disease with a toxic exposure, defendants are likely to argue that the effects of such exposure are not necessarily unique—i.e. that background pathogens or naturally-occurring substances could just as well have caused plaintiffs’ maladies. This argument is related to a sixth obstacle encountered by toxic tort plaintiffs: inadequate toxicological information exacerbated by limited technology capable of quantifying cause and effect relationships between toxins and diseases, and the enormous expense of trying to gather whatever information or expertise is available.

Toxic Torts History II, supra note 48 (manuscript at 31-32, on file with author).
determining toxic causation and liability have fascinated a number of scholars. In recent years, these perplexing questions that exist at the intersection of science and law have arisen in the lower state and federal courts. Therefore, in light of the importance of the issue and a judicial opportunity to pontificate on the subject, it is understandable why the

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Justices of the Supreme Court might have been inclined to discuss not only the reasons why the Federal Rules of Evidence had eclipsed Frye, but also scientific evidence and scientific experts generally.

III. SUPPORT FOR THE USE OF “GENERAL OBSERVATIONS”

One can articulate a number of plausible arguments supporting the Daubert Court’s use of “general observations” on expert scientific testimony to augment its ratio decidendi that Frye’s “general acceptance” standard has been overruled by the enactment of Federal Rule of Evidence 702. First, because of the importance of the question presented, the rarified federal issues at stake, and the ruling’s impact on the day-to-day evidentiary “judgment calls” by federal trial court judges presiding over technical jury trials throughout the nation, the Court probably wanted to provide administrative guidance to the federal courts that will be making rulings on admissibility of scientific expert testimony in an unfamiliar legal landscape without Frye. In essence, cognizant that Frye was now clearly buried, the Court probably wanted to settle the meaning of its ruling in Daubert up-front, instead of over a period of years.56

A second argument supporting the use of “general observations” on scientific expert testimony in Daubert is that Rule 702’s ambiguous use of the word “knowledge”57 as the predicate of an expert opinion requires authoritative amplification and contextual grounding by the Court. Certainly, “knowledge” as used in Rule 702 means more than a single subjective opinion or “unsupported speculation,”58 what some courts have referred to as a “net opinion,” but precisely how much more? Moreover, during oral argument, the Court’s colloquy with counsel often led to abstruse discussions of the nature of “scientific knowledge” which, arguably, required explication by the Court in order to avoid future confusion and litigation in implementing Daubert.59

56 Cf. SUP. CT. R. 10.1(c) (stating that one of the considerations for granting a writ of certiorari is that a court of appeals “has decided an important question of federal law which has not been, but should be, settled by [the] Court”). But see “Daubert” Will Not Resolve Confusion Over Expert Evidence, Attorneys Agree, 8 Toxics L. Rep. (BNA) 44, 45 (June 16, 1993) (noting that one attorney at the Association of Trial Lawyers of America Conference predicted that “due to a combination of conservatism and lack of experience in trying such cases, the [Court] will give no useful guidance as to what standards should be used in admitting testimony by scientific experts, but will ‘let lower courts wander around for a while’”).
57 FED. R. EVID. 702.
59 Transcript of Supreme Court Oral Argument in Daubert v. Merrell Dow
Third, the Court may have been justified in providing some extended commentary on the interrelationship between Rule 702 and its cognate provisions such as Rules 703, 104, and 403 because of the apparent interconnections between the provisions. Rule 702 constitutes the critical inquiry in determining the competency of an expert to testify to a particular fact or opinion.

Fourth, in light of the high profile concern in some quarters about the proliferation of "junk science" or "quack medicine" in civil cases, the Daubert Court might defend its elaboration of "general principles" regarding the admission of scientific expert testimony on political grounds. A bare bones decision overruling the Frye "general acceptance" test, without any amplification of the meaning of its order, could be viewed as a significant relaxing of scientific rigor by the Court in the federal judiciary's adjudication of complex litigations involving such subjects as biology, medicine, and chemistry. Therefore, the Court was reasonably justified in explaining that such an interpretation would be misguided. In so doing, the Court narrowed the debate from "What is junk science?" to "What is reliable science?"

IV. CRITICISMS OF THE COURT'S "GENERAL OBSERVATIONS"

Conversely, Chief Justice Rehnquist's objections to the Court's "general observations" about expert scientific testimony are trenchant...
criticisms of the expansive sweep of the Daubert opinion. Indeed, in the first part of his opinion, his "procedural dissent," the Chief Justice made out a prudent and well-reasoned case that once the Court decided the first question presented—whether the Frye general acceptance test survived the enactment of the Rules—in the negative, the further question presented was mooted.\textsuperscript{69} Paradoxically, the Daubert Court's "general comments" on expert scientific testimony present a double-edged risk. Some lower courts will give the comments "great weight," as feared by Chief Justice Rehnquist. In light of the abstract quality of the comments, however, other lower courts will likely choose to ignore them by following the admonition of Justice Jackson in Armour & Co. v. Wantock:

> It is timely again to remind counsel that words of our opinions are to be read in light of the facts of the case under discussion. To keep opinions within reasonable bounds precludes writing into them every limitation or variation which might be suggested by the circumstances of cases not before the Court. General expressions transposed to other facts are often misleading.\textsuperscript{64}

Moreover, previous commentators have amplified and elaborated on the underlying rationale of Rehnquist's procedural dissent in Daubert by observing that the mootness doctrine "is based [in part] on the [judiciary's] desire not to waste time in the futile decision of abstract questions, and in part on the belief that it is dangerous to formulate important precedents without an adequate, wholehearted and controversial presentation of the issue."\textsuperscript{65} Because "[m]oot cases have often been equated to advisory opinions .... there is a danger that advisory opinions will create undesirable precedents because the 'impact of actuality' is wanting."\textsuperscript{66} Thus, Chief Justice Rehnquist would contend that in spite of the voluminous number of amici briefs and the discussion of various bodies of scientific knowledge set forth in the briefs before the Court, this

\textsuperscript{69} See supra notes 30-34 and accompanying text. The traditional mootness doctrine has two alternative bases: (1) the Article III test of justiciability requiring a "case or controversy," see, e.g., United States Parole Comm'n v. Geraghty, 445 U.S. 388, 395-97 (1980); North Carolina v. Rice, 404 U.S. 244, 246 (1971), or (2) nonconstitutional discretionary elements of the justiciability doctrine, see, e.g., Kremens v. Bartley, 431 U.S. 119, 134 n.15 (1977).

\textsuperscript{64} Armour & Co. v. Wantock, 323 U.S. 126, 132 (1944) (emphasis added).

\textsuperscript{65} Note, "Moot" Administrative Orders, 53 Harv. L. Rev. 628, 629-30 (1940) (footnote omitted).

\textsuperscript{66} Note, Cases Moot on Appeal: A Limit on the Judicial Power, 103 U. Pa. L. Rev. 772, 774 (1955).
process of judicial decisionmaking is flawed because it is piecemeal, general, and not in the context of a live controversy.

The Chief Justice certainly is correct in asserting that "the ultimate legal question [in Daubert depended] on an appreciation of one or more bodies of knowledge not judicially noticeable." Rule 201's parameters for judicial notice of adjudicative facts... [require that a] judicially noticed fact must be one not subject to reasonable dispute in that it is either (1) generally known within the territorial jurisdiction of the trial court or (2) capable of accurate and ready determination by resort to sources whose accuracy cannot reasonably be questioned.

Indeed, the "definitions of scientific knowledge, scientific method, scientific validity and peer review" that the Court gleaned from secondary books, articles, and amici briefs to craft its "general observations" on expert scientific testimony are probably subject to "reasonable dispute" and are not "capable of accurate and ready determination" for three independent reasons.

First, in light of the philosophical and imprecise nature of definitions, it is likely that there are contending viewpoints as to meaning overlooked by the Court. Second, notions of "peer review" and "scientific validity" should be viewed in context, since different scientific disciplines may vary in their interpretation of these principles. Third, even if these concepts did span all scientific disciplines, reaching such a conclusion of definitional closure seems to require an ambitious, synoptical, and intellectual analysis of history not readily performed by appellate judges or their law clerks.

Chief Justice Rehnquist's specific points of disagreement with the Daubert Court's "general observations" on expert scientific testimony are also persuasive regarding the remainder of the majority's opinion. Rehnquist's first two specific objections to Daubert question the Court's analytical construct, which placed the nontextual "evidentiary reliability"—a phrase that the majority equates with "scientific validity" in cases involving proffered expert scientific testimony—on the same level of importance as Rule 402's precise textual reference to "relevancy." This use of terminology by the Daubert Court is flawed because of (a) a lack of precision in defining basic terminology in that the majority does not "set clear boundaries" between what the

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68 Fed. R. Evid. 201(b).
69 Daubert, 113 S. Ct. at 2799 (Rehnquist, C.J., concurring in part and dissenting in part).
70 See supra notes 36-44 and accompanying text.
definitions include and what they exclude (for example, that the "scientific status of a theory depends on its "falsifiability")\(^7\); (b) the inherent ambiguity of references to broad, philosophical benchmarks like "scientific," "scientific knowledge," "appropriate validation," and "scientific validity";\(^7\) (c) the idiosyncratic definition of many of these terms\(^7\) based on a linkage to the "scientific method"\(^4\); (d) incomplete definitions that rely upon the meaning of other terms that the Court failed to define,\(^7\) as well as key boundary questions that the Court left unresolved, such as the "difference between scientific knowledge and technical knowledge"\(^6\), and (e) the availability of counterfactual examples.\(^7\)

Furthermore, the Chief Justice's third specific objection to the "general observations" of the Court in Daubert, that Rule 702 does not impose on federal judges in their "gatekeeping responsibility in deciding questions of the admissibility of proffered expert testimony... either the obligation or the authority to become amateur scientists in order to perform that role,"\(^7\) is well-founded and makes pragmatic sense. In this regard, Rehnquist's more flexible interpretation of Rule 702 is equally as plausible as the majority's arguable overemphasis on judicial determination of "scientific validity" and insistence on strict adherence to the "scientific method"\(^7\) when expert scientific testimony is proffered for admission into evidence at trial. It seems reasonable to suppose that the key factor contemplated by the drafters of Rule 702 was whether "specialized knowledge will assist the trier of fact to

\(^7\) See supra note 44 and accompanying text. See generally PIERRE SCHLAG & DAVID SKOVER, TACTICS OF LEGAL REASONING 13 (1986) [hereinafter LEGAL REASONING] (explaining the problems that could arise with the use of an imprecise term); cf. infra notes 74-76 and accompanying text.

\(^7\) See generally LEGAL REASONING, supra note 71, at 14 (showing how ambiguity can result in a word having two or more meanings).

\(^7\) See generally id. at 14-15 (stating that definitions lead to value-laden or politically charged biases).

\(^7\) See supra notes 36-39 and accompanying text.

\(^7\) See generally LEGAL REASONING, supra note 71, at 16 (discussing the impact of incomplete definitions). For example, the Court does not define what it means by "scientific method," "appropriate validation," or "falsifiability." See supra notes 36-44 and accompanying text.

\(^7\) See supra notes 40-41 and accompanying text.

\(^7\) See LEGAL REASONING, supra note 71, at 16-17. For instance, in trying to explain a new phenomenon, scientists may theorize by analogy to other known processes and even engage in some speculation, thereby not following the strict scientific method in their initial approach to a problem. See infra notes 98-104 and accompanying text.

\(^7\) Daubert, 113 S. Ct. at 2800 (Rehnquist, C.J., concurring in part and dissenting in part); see supra note 45 and accompanying text.

\(^7\) See supra notes 36-44 and accompanying text.
understand the evidence or to determine a fact in issue," and not whether the proper scientific methodology supported any or all of the expert’s opinion. Rather, it is probable that Rule 702 has a broader meaning and purpose than the Daubert majority’s narrow focus on what may be called “scientific correctness.”

Conceivably, theories, speculation, and nonempirical systemic ideas offered by a knowledgeable scientific expert at one point in his or her testimony might assist the trier of fact in better conceptualizing a problem and in reaching a factual determination on an issue like causation. For example, if we assume that Rule 702 was applicable in the early part of the twentieth century when Einstein came up with his “Special Theory on Relativity,” and if we further assume that Einstein was called to testify in a civil case involving the issue of what is the speed of light, it might be helpful to the jury in making its determination to listen to the well-known, far-fetched, but concrete examples that Einstein used to illustrate his theory. A wise trial court judge might allow this type of testimony into evidence, subject to later limiting instructions or a later determination under Rule 403 that potential confusion might outweigh probative value. Moreover, in light of the past unsuccessful attempts by commentators to convince Congress that “scientific courts” should adjudicate scientific adjudicative cases, the Court arguably overstepped its role in interpreting congressional intent in promulgating Rule 702.

V. PRECEDENTIAL QUALITY OF THE COURT’S “GENERAL OBSERVATIONS”

Were I a legislator, I might be coaxed into voting for a statute very much like that which the Court ends up confusedly drafting in the course

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80 FED. R. EVID. 702 (emphasis added).
81 Some examples might be locomotive engines flying through space or train station observers suspended in time.
82 FED. R. EVID. 403.
83 These consist of “experts” who would apply “good science.”
of its discussion of "general observations" on expert scientific evidence. However, in the context of interpreting the Rules, which were promulgated by congressional imprimatur, the Court should not have acted as a super-legislature by, in effect, making an unsubstantiated amendment.

The pivotal issue in determining whether Chief Justice Rehnquist's opinion or the majority opinion in Daubert is correct is to decide the precedential quality—or stare decisis—of the "general observations" of the Daubert Court. One way of doing this is to ask whether the Court's "general observations" were in the nature of an amplification of the ratio decidendi that Frye did not survive the enactment of the Rules, or whether those comments were obiter dicta, which is generally perceived to be a counterproductive undertaking for a court. The problem, however, is that "[t]he distinction between holdings and dicta is often difficult to discern, especially in modern cases." One commentator has described this difficulty in somewhat cynical terms by saying that

[t]he traditional view is that a dictum is a statement in an opinion not necessary to the decision of the case. This means nothing. The only statement in an appellate opinion strictly necessary to the decision of the

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85 I would, however, insist that the statute contain more concrete and precise definitions of terminology.

86 After extensive study, Congress enacted the federal rules—as proposed in the Supreme Court's proposed Federal Rules of Evidence—with various amendments, to become effective July 1, 1975. 2 MCCORMICK ON EVIDENCE, App. A, at 547 (John W. Strong ed., 4th ed. 1992). "Thus the Federal Rules of Evidence are the product of both the rulemaking process established by the Supreme Court and the legislative process of the Congress." Id.


I am extremely reluctant to decide anything except what is necessary for the special case, because I believe by long experience that judgments come with far more weight and gravity when they come upon points which the judges are bound to decide, and I believe that obiter dicta, like the proverbial chickens of destiny, come home to roost sooner or later in a very uncomfortable way to the Judges who have uttered them, and are a great source of embarrassment in future cases.

Id., quoted in ROBERT A. LEFLAR, APPELLATE JUDICIAL OPINIONS 56 (1974); Yarmouth v. France, L.J. 57 Q.B. 9 (1887) (Lord Esher, M.R.) ("I detest any attempt to bring the law into maxims. Maxims are invariably wrong, that is, they are so general and large that they always include something which is not intended to be included."). quoted in LEFLAR, supra, at 59; Lochner v. New York, 198 U.S. 45, 76 (1905) (Holmes, J.) ("General propositions do not decide concrete cases."). quoted in LEFLAR, supra, at 59.

88 OXFORD COMPANION, supra note 6, at 602.
case is the order of the court. A quibble like this shows how useless the
definition is. 89

Presumably, the Daubert Court could take the position that its
"general observations" on expert scientific testimony are linked to its
holding regarding the inapplicability of the Frye rule. As such, the
"general comments" portion of the opinion could be reasonably inter-
preted as being part of the Daubert ratio decidendi. But future cases
involving the admissibility of "specialized knowledge" under Rule 702
are likely to create perplexing issues for the Court in reconciling a trial
court's sense of the justice of admitting expert scientific testimony with
the scientific community's position on the scientific correctness of the
evidence. Therefore, I predict that the Court will reserve the right to
"label" portions of its general statements in Daubert as being dicta in
order to avoid "[a] statement of the law that conflicts with the view[s] of
[various Justices]" 90 in future, difficult to resolve cases.

Another method of determining the precedential quality of the
Daubert Court's "general observations" on expert scientific testimony is
to approach the question from the standpoint of whether or not those
judicial observations are in the nature of advisory opinions. 91 Even if the
Court's "general observations" were deemed to be rendered on a moot
question and, therefore, advisory in nature, the Daubert majority could
defend its exegesis on scientific evidence as falling under the "public
interest exception" to the prohibition on judicial advisory opinions. 92

The best way, however, of evaluating the normative quality of
Daubert's "general observations" on expert scientific evidence is to follow
the approach advocated by Senior United States District Court Judge Jack
Weinstein: admit that "American judges [do], in fact, [render] advisory
opinions" 93 that often involve moot questions and obiter dicta, and focus
inquiry, instead, on the policy wisdom of the so-called judicial observa-
tions. The policy wisdom, according to Weinstein, should be evaluated
by asking a number of probing normative questions:

89 Comment, Dictum Revisited, 4 Stan. L. Rev. 509, 509-18 (1952), quoted in
Leflar, supra note 87, at 59.
90 Leflar, supra note 87, at 59.
91 See generally supra notes 65-66 and accompanying text (discussing the dangers
of rendering advisory opinions).
92 See Note, supra note 66, at 787, quoted in Leflar, supra note 87, at 63.
93 Jack Weinstein, Rendering Advisory Opinions—Do We, Should We?, 54
Judicature 140, 143 (1970), quoted in Leflar, supra note 87, at 63-64.
To what extent should [courts] move along the line from traditional American concepts of judicial functions toward advisory opinions? What are the dangers which need to be faced? Do courts run the risk of losing their sense of neutrality, of being committed to programs, and, perhaps, of becoming less credible in their stance of impartiality? . . . How far and how fast may or should the courts go, and what limits, if any, should there be?94

Resolution of the Weinsteinian project,95 in the context of evaluating the “general comments” of the Daubert Court on expert scientific testimony, results in a vindication of the concerns raised by Chief Justice Rehnquist’s dissent.

VI. APPLICATION OF THE WEINSTEIN AND ZIMAN APPROACHES

In evaluating the policy wisdom of the differing opinions of the Justices in Daubert, it is useful to turn to a sturdy scholarly benchmark: a book on the philosophy of science by John Ziman96 that was relied upon and cited in the majority opinion.97 Professor Ziman’s book is helpful in evaluating the Daubert opinions because it amplifies, expands upon, and critiques several of the principles and presuppositions articulated by the Justices.

By way of introduction to the complex subject of scientific reliability, Ziman begins his work with a riveting counterintuitive assertion: “It is important to realize that much of the research literature of science is intended rhetorically—to persuade other scientists of the validity of a new hypothesis or to shatter received opinions.” This contention, in turn, leads him to question Karl Popper’s famous criterion, which lies at the heart of the general comments of the Daubert Court, that an acceptable

94 Id.
95 See supra notes 93-94 and accompanying text.
96 JOHN ZIMAN, RELIABLE KNOWLEDGE: AN EXPLORATION OF THE GROUNDS FOR BELIEF IN SCIENCE (1978). Ziman is Professor Emeritus of Physics at the University of Bristol.
98 ZIMAN, supra note 96, at 7. Elsewhere in the book, Ziman observes: “A scientific message often has the purpose of changing a preconceived notion, demonstrating an unsuspected contradiction, or announcing an unexpected observation. It is addressed to an actual skeptic, a potential critic; it must be convincing, it must be watertight.” Id. at 12. Moreover, “intersubjective communication and persuasion are key factors in the machinery of science,” according to Ziman. Id. at 32.
scientific theory should, in principle, be falsifiable. Ziman characterizes Popper's criterion as "strategically sound but tactically indefensible" because of Popper's failure to realize the essentially rhetorical quality of scientific communication and the resulting ontological flux of cutting edge scientific knowledge. As Ziman explains, "[i]t turns out, in practice, that almost every theory is to some extent 'falsified' by the relevant observations: the question then hinges on whether this failure is to be treated as a genuine objection, or whether, pending conceivable improvements in formulation or computation, it may be temporarily overlooked."

Ziman also argues that a cognate problem of the inherent subjectivity of an individual scientist's view of what is or is not reliable knowledge is the related epistemological problem of paradigmatic multiplicity, "of interrelated models, experiments, concepts, mathematical techniques,

99 Daubert, 113 S. Ct. at 2797 (emphasis added); see also KARL R. POPPER, THE LOGIC OF SCIENTIFIC DISCOVERY (1959). A classic work on the philosophy of science, Popper is viewed by many as the most important contemporary philosopher of science. His major argument is that a hypothesis is scientific only if it can specify the results that would show it to be false. This allowed Popper to criticize as "pseudo-scientific" theories such as Marxism that prove to be circular in reasoning and are not capable of being shown to be falsifiable.

100 ZIMAN, supra note 96, at 35.

101 Id. Professor Ziman illustrates this assertion with a physicist's saga of "missing solar neutrinos":

Briefly, the accepted theories of nuclear reactions in the core of the sun predict the generation of a large flux of neutrinos, which should be observable as they pass through the earth. The neutrino is a very, very elusive particle, but it can be observed very, very occasionally, by very large, refined and expensive apparatus. Experiments of this kind, on a heroic scale, have not confirmed the theory; the flux of solar neutrinos is not precisely measurable, but in all experiments appears to be very much less than the theoretical value. But what has been falsified? Even if we accept the experimental results at their face value, this does not necessarily mean that the theory of nuclear reactions is all wrong. The calculations make many assumptions, such as the rate of mixing in the solar interior, or the uniformity of conditions over long periods of time, that are difficult to decide independently and that strongly affect the results. Some astrophysicists interpret the anomaly as a radical falsification of the theory, and are looking for new basic models of the solar-energy source; others, with equal justification, estimate the consequences of plausible modifications in the details of the conventional model, in order to "explain away" the anomaly. Whatever the outcome of this episode, which vividly illustrates the turmoil of imagination, scepticism and criticism, and the dynamical interaction between theory and observation, in this branch of science, only the hindsight of armchair theorists will eventually explain to us what was really being falsified and why.

Id. at 35-36 (footnotes omitted) (emphasis added).
instruments, materials, properties, etc. that constitute the corpus [of scientific knowledge] in a particular field. Focusing on his own field of physics, Professor Ziman observes:

Our confidence in any particular element of this science cannot be rested solely upon one or two other elements, but is deeply embedded in our consciousness of a multitude of related facts and opinions. Not all the elements of the network are of equal weight or credibility, but they must all be taken into account in an assessment of the reliability of our knowledge in that field. Many particular consequences of a theory may seem far from the experimental facts, yet the picture as a whole may be completely convincing for its consistency and wide application. Physicists do not accept the Schrödinger equation of wave mechanics just because it happened (like the Bohr theory of planetary orbits) to give the observed spectrum of a hydrogen atom: wave mechanics now stands unquestioned because it could explain more or less quantitatively, more or less successfully, almost all the properties of atoms, molecules and crystals. When, for a time, it seems to fail to explain some unusual phenomenon such as superconductivity, we scarcely conceive that it has been falsified, but assume that we have made a mistake in our calculations, or that we have misunderstood the physical situation.

Moreover, Ziman points out that in the real day-to-day world of scientific research and validation, the collective creation of reliable knowledge often follows tortuous and unpredictable pathways. By way of illustration, he writes:

[A physicist's] personal experience of the validation of scientific theories is usually very sobering. He learns how easy it is to persuade oneself of the validity of a model which later turns out to be false, and comes to realise that even in very strongly mathematical and well-defined scientific issues, it may take a long time, much criticism and the death of many promising conjectures (if not necessarily of their authors!) before a reliable theory is well-based and thoroughly acceptable.

102 Id. at 39. Ziman limited the language in the text to a description of physical science. Id. Nonetheless, his description—with some substitutes like the word “biomass” for “materials” and “behavior” for “properties”—would readily apply to other branches of science as well.

103 Id. at 39-40 (footnotes omitted) (emphasis added).
Even in physics, there is no infallible procedure for generating reliable knowledge. The calm order and perfection of well-established theories, accredited by innumerable items of evidence from a thousand different hands, eyes, and brains, is not characteristic of the frontline of research where controversy, conjecture, contradiction and confusion are rife. The physics of undergraduate text-books is 90% true; the contents of the primary research journals of physics is 90% false. The scientific system is as much involved in distilling the former out of the latter as it is in creating and transferring more and more bits of data and items of "information."  

The force of Professor Ziman's systematic analysis of the complex nature of the modern scientific process, both at the macro-level of elusive consensus and at the micro-level of subjective meaning, tends to undercut the hubris of the general observations on expert scientific testimony created by the Daubert majority. Indeed, Chief Justice Rehnquist's warning that "definitions of scientific knowledge, scientific method, scientific validity, and peer review ... [warrant the Court] ... to proceed with great caution in deciding more than [it has] to because [its] reach can so easily exceed [its] grasp"  

sounds prophetic.  

In the first place, while it is likely that a particular scientist's theory or technique can be tested, the significance of test results will vary depending on the particular scientist or group of scientists being questioned. Second, even if a scientific opinion in court has attracted widespread acceptance within a relevant scientific community, the reliability of the opinion may be questionable because of the tendency of set opinions to resist significant modification over time for purely sociological reasons. Third, in some areas of science, a striking percentage of journal literature will eventually be refuted and rejected; therefore, use of peer-reviewed publications as important indicia of scientific reliability seems arbitrary. As a corollary to this point, potential error rates and the existence and maintenance of standards for a particular scientific methodology are also due to substantial flux over time and between disciplines.

104 Id. at 40-41 (emphasis added).
105 Daubert, 113 S. Ct. at 2799 (Rehnquist, C.J., concurring in part and dissenting in part). Robert Browning wrote that a person's "reach should exceed his grasp, [o]r what's a heaven for?" ROBERT BROWNING, ANDREA DEL SARTO (1855), quoted in JOHN BARTLETT, FAMILIAR QUOTATIONS 543 (15th ed. 1980). Chief Justice Rehnquist's choice of language—"our reach can so easily exceed our grasp"—seems to be a play on Browning's words.
In short, the Court in Daubert has committed itself to a particular mode of interpretation regarding scientific reliability and admissibility of scientific evidence in federal courts that goes beyond the demonstrable text of the evidentiary rules. It seems likely that the Court in future opinions will attempt to defend its general comments and expound on them in the nature of continuing advisory opinions on the standards for reliable scientific knowledge. Even if such a judicial approach helps to manage the processing of scientific expert opinions in federal trials, it risks distorting the real nature of science and societal truth seeking.

CONCLUSION

The Daubert decision moves the federal judiciary away from the Frye "general acceptance" test for expert scientific testimony toward what may be characterized as a "general reliability" test. The Daubert opinion's grasp, however, exceeds its reach because of Professor Ziman's description of the profound ambiguity associated with generating "reliable knowledge," even by way of ostensibly "rigorous" processes like the "scientific method." Ironically, the seven Justices who agreed with the majority opinion in Daubert committed, by way of analogy, the conceptual mistake that laypersons often get trapped into making about the law. As any first year law student will point out to well-meaning relatives at a family gathering, there is no such thing as reliable blackletter rules in law. For every rule, there is an exception. For every principle, there is a counter-principle. So it is, as Ziman has explained, for science.

It may well be appropriate for the Court to encourage good scientific methodology and reasoning in adjudication before the federal courts. However, it is dangerous for the Court to straitjacket the development of scientific knowledge as it is broadly understood and applied to human problems and institutions. Only time will tell the magnitude of the dangers wrought by Daubert. For the moment, however, the Daubert decision seems to articulate a policy at war with itself: on the one hand, endorsing a "liberal" vision of the admissibility of scientific evidence under Rule 702 and, on the other hand, creating a series of amorphous and artificial barriers to admissibility based on a narrow and unrealistic view of "scientific correctness."106

106 See generally Special Report–Daubert: What's Next?, 8 Toxics L. Rep. (BNA) No. 9, Pt. II (Summer/Fall 1993) (offering several articles on the implications of Daubert on various aspects of toxic tort litigation); Timothy B. Dyk & Gregory A. Castanias, Daubert Doesn't End Debate on Experts, NAT'L LAW J., Aug. 2, 1993, at 17 (outlining the questions left unanswered by Daubert); Expert Opinion, Brave New World, 13 CAL.