Calabresi's Revenge? Junk Science in the Work of Peter Huber

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BOOK REVIEW

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JUNK SCIENCE IN
THE WORK OF PETER HUBER


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Galileo's Revenge: Junk Science in the Courtroom1 ("Revenge") has generated substantial publicity for Peter Huber's indictment of the judicial system for allowing pseudoscientific charlatans to dominate modern tort litigation.2 Revenge is a good read. Huber outrages his audience with well-written horror stories about erroneous jury verdicts based on bad science, from cancer "caused" by a bruise, to a soothsayer's loss of psychic powers "caused" by a CAT scan.

Huber is not alone in his concern about the problem of translating complex scientific evidence to lay factfinders within our adversary system. Academic commentators have written dozens of articles and books addressing the general topic of the role of expert witnesses in litigation3 and the specific question of the standards governing the

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admissibility of scientific evidence.4

Scientific evidence has played a major role in recent high-profile litigation in which the judiciary has been forced to grapple with the admissibility of new scientific aids to criminal investigation5 and controversial expert testimony that attributes various ailments to particular drugs or chemicals.6 In the Bendectin litigation, the federal courts have taken a variety of inconsistent approaches to the admissi-


bility of expert testimony on the causal link between the plaintiffs' birth defects and their mothers' ingestion of the anti-nausea drug Bendectin during pregnancy.7 The Supreme Court has granted certiorari to resolve the split among the circuits in the Bendectin cases, accepting review of the Ninth Circuit's *Daubert* opinion that cited *Revenge* in support of its decision to uphold the exclusion of testimony by the plaintiffs' expert, whose methodology was found to be inconsistent with the generally accepted procedures of recognized authorities.9

*Revenge* has also carried the issue of junk science into the realm of politics. Under the leadership of former Vice-President Dan Quayle, the President's Council on Competitiveness included "expert evidence reform" in its *Agenda for Civil Justice Reform in America*.10 Quayle adopted Huber's "junk science" rhetoric,11 and he cited *Revenge* in support of these proposals.12 The 1992 Republican platform included a promise to "throw out 'junk science'" from American courtrooms.13


9. *Daubert*, supra note 8, at 1131 (citing *Revenge*).


While *Revenge* has provided sound bytes for politicians, and serves as a secondary authority for judicial citation, the book adds little to the ongoing debate. Huber fails to prove his contentions about the extent and origins of the problem of junk science because his own methodology is little better than that of the charlatans he criticizes.

I. GALILEO’S *REVENGE IS JUNK LITIGATION SCIENCE*

The central premise of *Revenge* is that junk science is flooding our courtrooms because of the “let-it-all-in approach to expert testimony.” In a section titled “Toward the Far Side,” Huber likens the new “scientific mystics, speculators, cranks, and iconoclasts” to characters from a Gary Larson cartoon, each of whom “may claim, in short, to be a new Galileo, a lonely, misunderstood genius who can see wonders that others neither discern nor understand.” Huber attributes the profusion of junk science to the demise of the *Frye* rule. According to Huber, the *Frye* rule traditionally “allowed experts into court only if their testimony was founded on theories, methods, and procedures ‘generally accepted’ as valid among other scientists in the same field.”

Huber traces the “demise” of *Frye* to the 1975 adoption of the *Federal Rules of Evidence* (“FRE”). The FRE undeniably liberalized the treatment of expert testimony, and the FRE made no mention of the *Frye* test. From this silence, Huber infers that “[m]ainstream scientific consensus didn’t matter any more,” and he unequivocally asserts that *Frye* is dead:

The academics (as academics are prone to do) have continued to debate *Frye*’s demise long after the debate has ceased to be of any practical importance. Some insist that *Frye* still lives; others

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15. *Id.*
16. *Id.* at 16.
18. *REVENGE*, supra note 1, at 14. The decision in *Frye* did not apply to all expert testimony, but only to testimony based on a scientific device. *Frye* held that a primitive form of lie detector was not sufficiently reliable to warrant introduction of the results into evidence by the defendant. The courts have applied *Frye* more broadly, however, and it has come to be viewed as a general rule applicable to all scientifically-based evidence.
19. *Id.* at 15-16.
that it is dead and buried; others that, dead or alive, Frye no longer makes any practical difference. But with Frye certifiably absent from the rules of evidence, the academics might as well be debating the survival of Elvis Presley in the indubitably silent halls of Graceland. Whether or not Frye still lives, the conviction is gone, the music has died. Most courts have slouched toward what federal judge Patrick Higginbotham dubs the let-it-all-in approach to expert testimony.

Huber is wrong, and he knows better. Frye is not dead. Many courts continue to adhere to the Frye test by name. In most other jurisdictions, Frye lives on under an assumed name: the “strict scrutiny” version of the FRE’s “relevancy” test. Under the relevancy test of FRE 702, the trial judge must determine whether expert testimony is “helpful” by balancing its probative value against its potential to mislead the jury. The probative value of expert evidence depends on the reliability of both the underlying scientific theory or methodology (major premise) and the particular data (minor premise) on which the expert’s opinion is based. Whether or not the underlying scientific principles are generally accepted by experts in the field remains important in assessing the reliability of scientific evidence, along with such other factors as its degree of novelty in relationship to accepted

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20. Id. at 16-17.
21. See GIANNELLI & IMWINKELRIED, supra note 4, at § 1-5 n.44 (1991 supplement cites five recent state opinions that follow Frye). Frye is still referred to as the majority rule, even in state courts that decline to follow it. See, e.g., Prater v. State, 820 S.W.2d 429, 431 (Ark. 1991).

In applying Rule 702, there exists a further question as to whether the trial court is to determine the reliability of scientific knowledge as a “preliminary fact” according to the “preponderance of the evidence” standard of Rule 104(a), or the more relaxed “reasonable trier of fact could find” standard of Rule 104(b). See Brief for a Group of American Law Professors as Amicus Curiae in Support of Neither Party at 18-23, Daubert v. Merrell Dow Pharmaceuticals, Inc., cert. granted, 113 S. Ct. 320 (1992) (No. 92-102) (advocating Rule 104(a) standard).
principles, the extent to which it has been applied, the potential rate of error, the existence of specialized literature, and the qualifications of the particular expert witness.\textsuperscript{25} A conscientious application of the FRE’s relevancy test should reject expert testimony based on unreliable scientific theories or unreliable data. Indeed, the result under the Frye test and under a relevancy analysis often will be the same.\textsuperscript{26}

In the penultimate chapter of Revenge, Huber concedes that “at least some judges,” a “growing number,” are applying a strict version of the relevancy test, but he nevertheless asserts that “many judges still reject any such limits,” leaving the reader with the impression that junk science continues to dominate our courtrooms.\textsuperscript{27} In a recent law review adaptation of his book,\textsuperscript{28} Huber uses the same cases to tell a different story.\textsuperscript{29} In this article, Huber refers to a 1986 decision as “a major turning point in judicial attitude,”\textsuperscript{30} and he concludes that “the more recent trend appears to be toward reaffirming stricter standards against evidence from the fringes of the scientific community.”\textsuperscript{31} By way of contrast, on the last page of Revenge, Huber’s tone remains bitter and pessimistic:

It is not especially scientific to deny rules of evidence, to disdain the formalisms of serious science, to sit back, let everything in, and invite random groups of twelve stout citizens to vote as they please. Such attitudes serve no one but the lawyers who act as impresarios

\textsuperscript{25} Giannelli & Imwinkelried, supra note 4, § 1-6, at 32; Weinstein & Berger, supra note 23, ¶ 702[03], at 702-41 to 702-42; McCormick, supra note 4, at 911-12. See, e.g., United States v. Downing 753 F.2d 1224 (3d Cir. 1985).

\textsuperscript{26} Weinstein & Berger, supra note 23, ¶ 702[03], at 702-44. Compare, e.g., Christophersen v. Allied-Signal Corp., 939 F.2d 1106 (5th Cir. 1991) (en banc) (approving exclusion of evidence based on Frye test), cert. denied, 112 S. Ct. 1280 (1992) with id. at 1119 (Clark, C.J., concurring in the result) (approving exclusion of evidence based on relevancy test).

\textsuperscript{27} Revenge, supra note 1, at 204-05.

\textsuperscript{28} Peter Huber, Junk Science in the Courtroom, 26 Val. U. L. Rev. 723 (1992). An efficient recycler, Huber is also including this material as a chapter in a forthcoming book on scientific inference and the law.

\textsuperscript{29} Where the article differs from the book is in their respective descriptions of the nature and extent of the problem of junk science in the courtroom. Compare Huber, supra note 28, at 723-38 with Revenge, supra note 1, generally. The second half of the article, which discusses possible solutions to the problem of junk science, is essentially a verbatim reproduction of chapter 11 of Revenge. Compare Huber, supra note 28, at 739-55 with Revenge, supra note 1, at 194-213.

\textsuperscript{30} Huber, supra note 28, at 734. The decision in question is In re Air Crash Disaster, 795 F.2d 1230 (5th Cir. 1986) (Higginbotham, J.).

\textsuperscript{31} Huber, supra note 28, at 736.
Thus, even though Huber’s academic article concedes that the turning point has been passed and that the recent trend is toward stricter judicial scrutiny of scientific evidence, the rhetoric and structure of Revenge convey the ominous warning that junk science is out of control in the courtroom and wreaking havoc on society. In sum, writing for different audiences, Huber manipulates the same evidence to reach diametrically opposite conclusions.

Huber’s evaluation of the impact of junk science does not measure up to the standards of scientific methodology which he advocates for others. Eschewing rigorous empirical investigation, Revenge is entirely anecdotal. At the core of the work are over 100 pages of horror stories about the legal system’s mishandling of scientifically untenable claims that various persons or entities were the cause of the victims’ damages.

Compounding the anecdotal character of his evidence is the fact that, despite Huber’s overblown rhetoric, these stories do not reveal a pattern of systematic judicial acceptance of junk science, nor do they uniformly support his thesis that we face a serious threat from junk science in the courtroom. Huber can point to very few cases in

32. Revenge, supra note 1, at 228.
33. The book’s six central chapters describe the legal implications of six pseudo-scientific falsehoods: Chapter 3, “The Midas Touch”—cancer caused by physical injury; Chapter 4, “Sudden Acceleration”—accidents caused by sudden acceleration of the Audi 5000; Chapter 5, “Gadgets and Knives”—cerebral palsy caused by birth trauma; Chapter 6, “No Immunity”—chemically-induced immunodeficiency or “chemical AIDS”; Chapter 7, “Nausea”—birth defects caused by Bendectin; Chapter 8, “The Paranoia Plebiscite”—recoveries for unfounded fear of future medical problems, especially cancer and more recently AIDS.

Because of Huber’s partisanship and his polemical tone, I was not always persuaded by his evaluation of the underlying science. For example, the expert testimony supporting plaintiffs’ claims in the Bendectin litigation received a far more respectful evaluation in DeLuca v. Merrell Dow Pharmaceuticals, Inc., 911 F.2d 941 (3d Cir. 1990). Also, Huber uniformly portrays the supposed experts and their attorneys as though all were consciously perpetrating scientific fraud, making no effort to distinguish “junk science” from controversial science, or charlatans from sincere believers.

34. For example, with respect to unwarranted claims of traumatically-induced cancer, most of the cases arose in the context of worker compensation claims; as Huber recognizes, the ultimate source of the problem was not junk science in the courtroom but rather the limited scope of review of administrative findings in such cases when the loyal treating physician had opined that the cancer was caused by the trauma. See Revenge, supra note 1, at 47. Moreover, Huber never establishes that the erroneous rulings for the plaintiffs were contrary to the current scientific consensus. Huber says that courts began to rule against the plaintiffs in the 1950s, and the stream of erroneous verdicts dried up by the 1970s, which seems to correspond with the emergence of a scientific consensus on this point as reflected in a 1974 publication which Huber cites. See id. at 52-56. While articles questioning the
which plaintiffs ultimately prevailed on the basis of unsound expert testimony. Instead, it appears that some of the plaintiffs' recoveries were consistent with the contemporary scientific consensus, that the most outrageous jury verdicts (including the award for loss of psychic powers from a CAT scan) were overturned by trial judges or appellate courts, and that junk science causes more problems in administrative agencies and in the media than in the courtroom.

Huber paints with a broad brush, and he demonstrates little appreciation for the subtleties of the issues he addresses. He appears to lack the practical experience with litigation that he insists courts should demand of those who seek to testify as experts. Huber applauds recent state laws establishing standards for expert witnesses that require substantial familiarity with the procedures in question and bar testimony by professional experts who spend more than twenty percent of their time in court or by "academics who do not practice at all." Although I do not necessarily endorse these standards, it seems fair to apply them to their proponent. Huber has both a J.D. and Ph.D.; according to the book jacket he is a former law clerk for a Supreme Court Justice, a Senior Fellow of the Manhattan Institute, relationship between trauma and cancer were published in the 1920s and 1930s, Huber does not describe the scientific consensus prior to 1974, so it is not clear whether the medical testimony supporting the plaintiffs' recoveries in that period was contrary to the current consensus. Finally, these traumatic cancer cases all were decided during the heyday of the Frye rule and prior to the promulgation of the FRE, so they provide no support for Huber's claim that the FRE are responsible for the introduction of junk science.

With respect to lawsuits seeking recovery for birth defects, Huber does not describe the scientific consensus on the relationship between cerebral palsy and birth trauma prior to a 1986 publication in the New England Journal of Medicine which showed an absence of correlation. Thus, from Huber's evidence it is quite possible that the prevalence of electronic fetal monitoring and the associated increase in the rate of cesarean sections in the 1970s reflected the current medical consensus on appropriate treatment, rather than a response to the risk of legal liability, as Huber claims.

The chapter on accelerating Audis implicated the media far more than the courts. Although Audi lost a few cases, it won most of them, and the loss in sales was primarily attributable to negative publicity.

Huber's recounting of the Bendectin and chemical AIDS litigation, if true, portrays appalling behavior by lawyers and their supposed experts, but in Huber's tale the courts ultimately seem to have succeeded in separating the wheat from the chaff. Indeed, in their diverse rulings against the plaintiffs under a variety of inconsistent approaches, the courts arguably exceeded their authority under the FRE. McCarthy, supra note 4. The Supreme Court has recently granted certiorari in one of the Bendectin cases, and it is likely to clarify the application of the FRE to expert testimony based on controversial methodologies. Daubert v. Merrell Dow Pharmaceuticals, Inc., 951 F.2d 1128 (9th Cir. 1991), cert. granted, 113 S. Ct. 320 (1992).

35. REVENGE, supra note 1, at 205-06.
a regular columnist for *Forbes* magazine, and the author of *Liability: The Legal Revolution and Its Consequences*. But has Huber been an active participant in the legal practice that he criticizes? How many cases has he litigated? Did he even spend a year as a clerk for a trial judge? Regardless of whether Huber is more accurately labeled an "academic" or a "professional expert" in the field of litigation science, his credentials certainly do not satisfy his own criterion of hands-on practical experience.

Huber equates valid science with scientific consensus, and he extols the virtues of "professional journal and peer review" as criteria for identification of valid science. So what is the consensus among leading legal experts in their professional publications on this topic? All seem to agree that this is a serious problem and that the rules need to be tightened up and systematized because the dynamic state of the law has generated substantial unpredictability and yielded an occasional aberrational decision. "Revenge" stands almost alone, however, in portraying the problem as a crisis. When put to the test in an academic (though not peer-reviewed) publication, Huber himself admits that the turning point has passed and that courts and legislatures are responding appropriately. When measured by Huber's standard of scientific consensus as reflected in academic publication, *Revenge* is

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37. *Revenge*, supra note 1, at 205. Huber’s faith in peer review is unwarranted. See Brief of Amici Curiae Daryl E. Chubin, Ph.D., Edward J. Hackett, Ph.D., David Michael Ozonoff, M.D., M.P.H., Richard W. Clapp, Sc.D., M.P.H., in Support of Petitioners at 8, Daubert v. Merrell Dow Pharmaceuticals, Inc., cert. granted, 113 S. Ct. 320 (1992) (No. 92-102) ("[T]he peer review system is designed to provide a common and convenient starting point for scientific debate, not the final summation of existing scientific knowledge."); Brief Amici Curiae of Physicians, Scientists, and Historians of Science in Support of Petitioners, id. at 16-17. ("But the appearance of a study in a peer-reviewed journal does not necessarily mean that the study is generally accepted or even sound. Conversely, the fact that a study has not been published in a peer-reviewed journal does not mean that the study and any opinion based thereon are unreliable and would of no help in resolving a question of fact."); see also, Brief of the Carnegie Commission on Science, Technology, and Government as Amicus Curiae in Support of Neither Party, id. at 26. ("A requirement that all studies must be peer-reviewed before they can be relied upon by an expert witness presupposes a view of litigation and science at odds with reality . . . . [O]ften the studies that become relevant in determining a legal issue are initiated in reaction to the litigation process.")

38. For example, the leading works on the standards governing admissibility of scientific evidence by Margaret Berger, Bert Black, Paul Giannelli, Kenneth Kreiling, Frederic Lederer, Mark McCormick, Andre Moenssens, Stephen Saltzburg, and James Starrs, see supra note 3, all propose quite modest reinterpretations or revisions of FRE 702; see also Fed. R. Evid. 702 (proposed), 137 F.R.D. 156 (1991).
That Huber emphasizes the bad news in Revenge should not surprise anyone. Good news doesn’t sell. That Huber has distorted his expert opinion, either for pecuniary gain or polemical advantage, may not be shocking, but it is somewhat ironic. One of the primary reasons for junk science in the courtroom, according to Huber, is the incentive structure created by the legal environment, which by “unnatural selection” yields expert witnesses who are “hired gun[s],” “saxophones,” “hookers,” and “Mr. Professional Witness, U.S.A.” It appears that experts in litigation science, especially those employed by ideological think tanks such as the Manhattan Institute, are not immune to such temptations.

II. CALABRESI’S REVENGE?

One of Huber’s most provocative assertions in Revenge is the claim that Guido Calabresi was responsible for the rise of junk science. Now Dean of the Yale Law School, Calabresi was one of the founders of modern “Law and Economics.” In contrast to the conservative “Chicago School” of law and economics, which measures all legal rules against the presumptive efficiency of the existing market system, Calabresi’s “Yale School” recognizes that economic efficiency is only one of many goals of the legal system, and it focuses on legal rules applicable to transactions in which the market is unlikely to yield an efficient solution. These situations of market fail-

39. REVENGE, supra note 1, at 19.
40. See id. at 11-13.
ure tend to be characterized by problems that the new Law and Economics refers to as “transaction costs”: lack of information, externalities of cost or benefit, barriers to negotiations, and strategic behavior by holdouts and free-riders.

Employing a “functional approach,” Calabresi has attempted to formulate a general theory of liability, particularly in the field of accident law. For Calabresi, the principal aim of liability rules is the reduction of accident costs, which encompasses three sub-goals: (a) reducing the number and severity of accidents; (b) reducing social costs resulting from accidents; and (c) reducing administrative costs of the liability system. Reduction in the number and severity of accidents can be accomplished through “specific deterrence” (or “collective deterrence”), which creates direct incentives for making activities safer by the threat of imposing liability on the actors, and through “general deterrence” (or “market deterrence”), which discourages participation in accident-producing activities by raising the effective cost or price to the participants.

One of Calabresi’s chief contributions to current theory is his conclusion that specific deterrence is most efficiently accomplished by imposing the cost of accidents on the party who is best able to prevent or avoid the damages, described in shorthand as the “cheapest cost avoider” of the conflict. Imposition of legal liability on the cheapest cost avoider creates incentives for that person to take appropriate precautions, whereas imposition of liability on anyone else will either create incentives for the wrong person to act, or entail costly negotiations among the parties to shift responsibility to the appropriate actor. Calabresi’s contribution has been criticized on theoretical grounds, but Huber is the first to blame Calabresi for the practical consequences of his theory.

According to Huber, Calabresi’s thesis that courts should impose the accident costs on the cheapest cost avoider gave rise to a new field of “liability science,” a “new school” of “legal academics” whose “ambitious mission” was to make the common law “a far-reaching instrument of social control.” The search for the cheapest

primarily reflect the approach of the Chicago school.

44. Id. at 36; see also THE COSTS OF ACCIDENTS, supra note 41, at 24-31.
45. See THE COSTS OF ACCIDENTS, supra note 41, at 68-69, 95-96.
46. See Calabresi & Hirschoff, supra note 41, at 1060.
47. REVENGE, supra note 1, at 11-12.
cost avoider was "a prescription for bringing innumerable new scientific controversies into court." \cite{48} Huber asserts that "more cases began to turn entirely on the science of cause and effect," \cite{49} and that the "Calabresian" search for the cheapest cost avoider induced the judiciary to open the courtrooms to junk science:

> Frye held sway until the 1970s, when it collided with the high ambition of the Calabresians . . . .

> . . . The search for the cheapest possible control must inevitably lead out to the edges of scientific knowledge . . . .

> A far-ranging search for causes to control is needed—indeed, it is needed all the more—when known causes are in short supply. . . . Whatever we do (many an overeager Calabresian quickly concludes), we must do something. Perhaps the scientist who claims ignorance is just too cautious. . . .

> Thus, a profession whose declared mission is control, first and last, will control, one way or another, even if it comes (as it has in times past) to burning witches. \cite{50}

So the search for the cheapest cost avoider has led to the burning of witches! Of course, Huber does not provide a single reference to any "overeager Calabresian" who ever advocated imposing costs on an activity having no provable causal connection with the plaintiff's damages. So where is Huber's evidence for the link between Guido Calabresi and junk science?

Huber points an accusing finger at Calabresi's oft-cited essay Concerning Cause and the Law of Torts, \cite{51} stating: "Guido Calabresi himself argued that liability should be based not on 'cause' but on 'causal linkage,' something weaker, though how much weaker remains unclear." \cite{52} Huber has misread the essay, and he misunderstands Calabresi's concept of "causal linkage." Causal linkage is not "something weaker" than actual cause, as Huber claims, but instead represents a genuine scientific approach to the question of causation.

Calabresi's essay on causation explores the functional role of three distinct concepts of causation: "causal linkage," "but for cause," and "proximate cause." While the last two terms are familiar legal

\begin{thebibliography}{52}
\bibitem{48} Id. at 13.
\bibitem{49} Id.
\bibitem{50} Id. at 15, 21-23.
\bibitem{51} Concerning Cause, supra note 41.
\bibitem{52} REVENGE, supra note 1, at 150.
\end{thebibliography}
concepts, the first is explicitly scientific:

The first concept, as I shall use it, is entirely predictive and empirical. There is a causal link between an act or activity and an injury when we conclude on the basis of the available evidence that the recurrence of that act or activity will increase the chances that the injury will also occur.\(^{53}\)

Calabresi endorses the flexible and functional approach of the common law courts, which employ all three concepts to promote a variety of policy goals. Application of the concept of causal linkage certainly demands reliance on scientific and statistical evidence. But neither in this nor in any of Calabresi’s other works is there any hint of a role for bad science or false claims of causal linkage.

While he criticizes Calabresi’s “weak” concept of causal linkage, Huber never explains what a “strong” scientific definition of causation would entail. The index entries for “cause, definition of” all refer to discussions of supposedly wrongheaded definitions of cause by “Calabresian liability scientists.”\(^{54}\)

Huber’s own conception of causation appears to be both naive and self-contradictory. He says: “Causes just are, whether or not we understand them . . . .”\(^{55}\) He purports to “believe in the existence of objective fact, which ultimately means positive science.”\(^{56}\) He declares that “science’s definition of cause . . . is the only one that is objectively verifiable. This is an utterly safe statement: the domain of systematic, objective verification is by definition the domain of science.”\(^{57}\) But, following Kuhn, Huber says that “a scientific ‘fact’ is the collective judgment of a specialized community.”\(^{58}\)

Well, which is it? Do “causes” exist objectively, without regard to our understanding of them, or are they social constructs that represent the current collective judgment of the community? I believe that both Huber and Calabresi would endorse the latter view, at least for purposes of making legal decisions. Operating within this consensus, Huber would test the hypothesis of a causal relationship between X and Y through systematic empirical verification employing accepted

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53. Concerning Cause, supra note 41, at 71.
54. REVENGE, supra note 1, at 266.
55. Id. at 222.
56. Id. at 218-19.
57. Id. at 222.
58. Id. at 226 (citing THOMAS S. KUHN, THE STRUCTURE OF SCIENTIFIC REVOLUTIONS (2d ed. 1970)).
methodologies. Such an empirical approach to causation appears to be precisely what Calabresi means by causal linkage. How, then, can Huber claim that Calabresi's causal linkage is a “weak” conception of cause, when it is entirely consistent with Huber’s “scientific” approach?

Even if Huber were correct about the demise of the Frye rule and about the weak conception of cause among Calabresian liability scientists, his methodology for linking these two phenomena is unacceptable. Huber correctly criticizes experts who intuitively infer a causal connection between events A and B based on the mere fact of their temporal sequence. Yet even granting Huber his factual premises, he is guilty of precisely the same spurious inference. That is, he provides no basis for his inference of a causal relationship between the supposed demise of Frye and the supposedly weak concept of cause among Calabresians. Huber cannot point to a single opinion in which a court employed bad science for explicitly Calabresian purposes. Huber is content to rely on the intuitive inference that if Calabresi advocates imposition of liability on certain enterprises, and if bad science can be used to impose liability on those enterprises, then Calabresi must advocate bad science. This is nonsense, and it is an entirely unfair attack on the work of Dean Calabresi.

Significantly, in the academic article adapted from this book, Huber drops all reference to Calabresi and “liability science.” Guilt by association may work in the popular press, but Huber knows it won’t wash in a professional journal. Again, measured by Huber’s own standards, Revenge is junk science.

III. THE NOT-SO-HIDDEN AGENDA AND THE UNANSWERED QUESTIONS

The gratuitous attack on Dean Calabresi is significant in highlighting Huber’s real agenda in Revenge. The ultimate enemy, for Huber, is not bad science, but “enterprise liability,” which was the object of Huber’s wrath in his 1988 work, Liability: The Legal Revolution and Its Consequences (“Liability”).

59. Id. at 48.
60. Indeed, it is difficult to find opinions in which courts explicitly employ Calabresian reasoning. Although Calabresi’s works are frequently cited by the courts, recent scholarship suggests that their impact on the substance of tort law has been insignificant. See Izhak Englard, Law and Economics in American Tort Cases: A Critical Assessment of the Theory’s Impact on Courts, 41 U. TORONTO L.J. 359, 362 (1991).
“Enterprise liability” refers to the idea that businesses should be held absolutely responsible, on a no-fault basis, for harms caused by their goods and services and by any activities relating to their production. Though he was not the originator of the concept, Calabresi embraced enterprise liability as a means to achieve primary accident cost reduction. To the extent that an enterprise is the cheapest cost avoider of certain accidents, enterprise liability achieves efficient specific deterrence by inducing the enterprise to take cost-effective precautions. And enterprise liability achieves efficient general or market deterrence by forcing the enterprise to bear the costs of accidents it causes, thereby “internalizing” those costs so that they will be reflected in the price of its products.

In Liability, Huber claimed that the American legal system had adopted the principle of enterprise liability. He then criticized American tort law, asserting that it fails to remove unsafe products from the market, discourages innovation, and renders safe products unduly expensive or unavailable. Huber repeats many of these arguments in chapter ten of Revenge. He contends that regulatory agencies are far more effective than litigation in uncovering and addressing such scientific and medical problems as swine flu vaccine, cancers from DES, toxic shock syndrome, the Dalkon Shield, and the exploding Ford Pinto. He also argues that “[j]unk science verdicts raise prices, lower production, and deter consumption.”

Erroneous verdicts or the fear thereof have driven safe and valuable products off the market (e.g., Audis, Bendectin, IUDs). Consequently, consumers suffer from the absence of these products as well as the higher prices of less safe substitutes.

Liability was the subject of a devastating review by Joseph Page. Page rejected Huber’s underlying premise that the American tort system has embraced the concept of enterprise liability, and he

61. REVENGE, supra note 1, at 181.
62. Joseph A. Page, Deforming Tort Reform, 78 Geo. L.J. 649 (1990) (book review). In phrases that could also be applied to Revenge, Page said that Liability was “harsh, though not always original,” id. at 660; it employed an anecdotal methodology replete with “inaccuracies and distortions,” id. at 659; it made oversimplified and overstated arguments based on sketchy evidence, id. at 673, 683; it “[r]educed legal history to caricature” by fabricating academic conspiracies that amounted to “flights of fancy” based on spurious causal reasoning, id. at 661, 671; and it was written in “a voice that ranges from brisk to acerbic to mean-spirited,” id. at 659.
63. Id. at 663-68. Strict liability applies only to “defective” products, and even there a negligence-like standard is used to determine whether a product is defective (“unreasonably dangerous”) due to a manufacturing defect, a faulty design or an inadequate warning. In the
disagreed with Huber’s criticisms of the system. Page pointed out numerous instances in which tort law helped remove dangerous products from the market, and he questioned the extent to which the threat of liability has unduly raised prices or deprived American consumers of new or safe products.\(^6^4\)

Echoing his earlier book, in chapter nine of *Revenge*, “Harmonious Coupling,” Huber criticizes tort law for allowing the “motherless calf” to be suckled by any cow that “must somehow deserve to be milked.”\(^6^5\) In addition to reiterating his argument that the law allows recovery under relaxed standards of causation (“science without the details”),\(^6^6\) Huber complains that the law capriciously selects risks from the “causation pack”\(^6^7\) of multiple causal agents by “[m]inimizing, discounting, overlooking, or omitting the effects of self-poisoning and self-destruction.”\(^6^8\)

Ironically, Huber’s last argument is essentially Calabresian. That is, the victims who have it within their power to prevent injuries caused by alcohol, tobacco, handguns, and automobiles may be the cheapest cost avoiders of these damages. A Calabresian judge, if any exist, might well be persuaded by Huber’s argument that the assumption of risk or contributory negligence defense should be applied to accident victims who did not wear seatbelts, to lung cancer victims who smoked cigarettes, or to victims of pelvic inflammatory disease from the Dalkon Shield who engaged in non-marital sex.

Another Calabresian approach to these issues, however, would be to internalize the costs of injuries and accidents to the activities that generate those costs. The rationale for cost internalization is that the price of these activities should reflect all of their associated costs, for otherwise the producers and consumers are receiving an implicit subsidy at the expense of the victims. In Calabresian terms, cost internalization promotes the goal of general or market deterrence by increasing the price of risky activities and inducing consumers to substitute other less costly activities.

The concept of cost internalization does not, however, answer the absence of statutory protection, traditional fault-based tort principles continue to govern most claims for injuries resulting from the conduct of corporate employees or from the by-products of industrial production.

\(^{64}\) Id. at 678-89.
\(^{65}\) *Revenge*, supra note 1, at 149-50.
\(^{66}\) Id. at 155-59.
\(^{67}\) Id. at 159.
\(^{68}\) Id. at 166.
question of how to internalize the cost when two or more activities contribute to causing damage or injury. Nobel laureate Ronald Coase’s seminal article emphasized the reciprocal nature of such conflicts. Coase pointed out that the cost of crop damage from straying cattle could be viewed as a cost of cattle-raising or a cost of farming. Similarly, the cost of injuries from alcohol-induced auto accidents could be viewed as a cost of driving or a cost of drinking. If we want to internalize these costs, to what extent should each activity bear them, and is it better to use liability rules within the judicial system or turn to the legislature for various combinations of direct regulation and taxation? These are interesting and important questions, for which neither science nor economics has easy answers.

The greatest challenge now confronting the American legal system is the question of how to deal with the inherent risks of life in modern society. Citizens are exposed to risk on a daily basis as drivers, as consumers, as employees, as hospital patients, and in a variety of other situations. Mainstream science has established that many of our products and by-products cause measurable increases in the risk of serious injury and disease. Not just alcohol, cigarettes, handguns and automobiles, but coal dust, asbestos, hazardous waste, and air and water pollution all increase these risks. The legal system’s response to statistical risk in the context of “toxic torts” has generated a vast literature. Toxic tort litigation has raised various issues related to proof of legal causation, including an emphasis on statistical perspectives on causation in lieu of the traditional mechanistic conception and an emerging preference for epidemiological evidence in lieu of the legal system’s traditional reliance on hands-on clinical judgment.

The legal system’s dilemma is starkly portrayed in the paradigmatic hypothetical of a toxic agent which is known to raise the incidence of a particular disease by some specified amount over the normal background rate for that disease. Suppose the very best science establishes that exposure to toxic agent X increases the incidence of a particular cancer by twenty-five percent, from 100 cases per 100,000 citizens in a non-exposed population to 125 cases per 100,000 in an exposed population. In a lawsuit against a defendant

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71. Daniel A. Farber, Toxic Causation, 71 MINN. L. REV. 1219, 1238 (1987) (discussing leading works that have employed this paradigm).
responsible for exposing 100,000 citizens to agent X, traditional legal doctrine might not allow recovery by any of the 125 cancer victims, because none of them could show that the exposure was the legal cause of the cancer. In order to recover, each victim would need an expert to testify that, to a reasonable degree of medical or scientific certainty, the victim probably would not have developed the disease in the absence of exposure. Yet for any one victim, an honest expert would only be able to say that the exposure increased the risk by twenty-five percent, and that it is more probable than not that the victim would have developed the disease in any event. One possible alternative would be to allow recovery in full by all 125 cancer victims, perhaps based on a determination that the exposure was probably a substantial contributing factor in each case. But this


On the other hand, consistent application of the preponderance of the evidence standard would warrant abandonment of the conventional scientific requirement of 95 percent "statistical significance" in epidemiologic data. The conventional 95 percent confidence level is unduly conservative, for by limiting the risk of an erroneous attribution of causation (Type I error) to 5 percent, it creates a far greater risk, possibly as high as 50 percent, of an erroneous failure to find causation (Type II error). See DeLuca v. Merrell Dow Pharmaceuticals, Inc., supra, at 945-49, 953-57; Neil B. Cohen, Confidence in Probability: Burdens of Persuasion in a World of Imperfect Knowledge, 60 N.Y.U. L. Rev. 385, 409-13 (1985). A better approach involves the use of "confidence intervals." "A confidence interval is a range of possible values for a parameter that is consistent with the observed data within specified limits." Brief of Amici Curiae Professors Kenneth Rothman, Noel Weiss, James Robbins, Raymond Neutra, and Steven Stellman, in Support of Petitioners at 7, Daubert v. Merrell Dow Pharmaceuticals, Inc., 951 F.2d 1128 (9th Cir. 1991), cert. granted, 113 S. Ct. 320 (1992) (No. 92-102); see also DeLuca, supra; Cohen, supra. Data can be reported in terms of the confidence interval for various confidence levels, e.g., 95%, 90%, 80%. The preponderance of the evidence standard suggests a selection of a confidence interval "that equals the risk of Type I and Type II errors;" despite its "conceptual advantages," such an approach must be used "heuristically rather than mechanically" due to the impossibility of computing precise numerical values. Cohen, supra, at 417.

73. See Gold, supra note 72, at 395-96. Alternatively, instead of relying solely on epidemiologic data, a treating physician or other clinician could base a finding of causation on a clinical judgment that would reflect the expert's scientific knowledge of the toxic tendency of the agent combined with particular facts about the individual victim's intensity of exposure, pattern of symptoms, time of onset, etc. See Charles Nesson, Agent Orange Meets
approach arguably provides a windfall to the 100 victims who would have developed cancer in any event, while imposing a disproportionate penalty on the defendant. And from an economic perspective, this approach creates too much cost internalization, forcing the defendant to bear the cost of 125 cancers when it "caused" only 25. Most commentators favor awarding partial damages to all of the victims, with recoveries proportional to the probability of causation, though they disagree as to whether this can be accomplished through the tort system or some other institutional arrangement.

Huber does not address these issues at all, except insofar as he would deny all compensation to victims whenever their own activity had contributed to an increased risk of injury or disease. Perhaps Huber should not be faulted for failing to explore the meaning of causation or evaluate the legal standard for imposing liability in toxic tort litigation, which were not the subjects of his book. He can be

74. Farber, supra note 71, at 1220. In the above hypothetical, there is a 25/125 or 20% chance that the exposure caused the plaintiff's cancer, so each of the 125 plaintiffs would recover 20% of his or her total damages, while the defendant would be held liable for the cost of 25 cancers. William Landes and Richard Posner agree that the defendant should be held liable for the cost of 25 cancers, but they would prefer to divide this sum among all of the 100,000 exposed individuals as compensation for being subjected to the increased risk of disease. William N. Landes & Richard A. Posner, The Economic Structure of Tort Law 263-69 (1987).

My own view, for what it is worth, is that all 100,000 exposed individuals who are victims of a legal wrong should recover from the defendant for the scientifically well-founded fear and emotional distress associated with their increased risk of developing cancer, which is separate from the cost of the cancer itself. See E. Donald Elliott, The Future of Toxic Torts: Of Chemophobia, Risk as a Compensable Injury and Hybrid Compensation Systems, 25 Hous. L. Rev. 781, 785-90 (1988); Jeff L. Lewin, Is Justice Implicitly Efficient?, 38 J. Legal Educ. 423, 435 & n.24 (1988) (book review of Landes & Posner, supra). With regard to the cost of the extra 25 cancers, the common law is incapable of justly or efficiently allocating their cost via the tort system. Instead, the goal of fair compensation could be fulfilled by having a government insurance program make payments to all 125 cancer victims, while the principle of responsibility and the goal of deterrence both could be satisfied by a regulatory scheme that required the defendant to reimburse the insurance program for the cost of the extra 25 cancers it caused.

75. On the other hand, by examining the problem of junk science in isolation from this context, Huber fails to recognize that the scientifically distorted expert opinions about causation are the inevitable concomitant of a tort system that provides compensation only for actual injury and not for the increased risk of disease and the fear thereof. See Elliott, supra note 74, at 786 ("[T]he unreasonably demanding standard of traditional tort law virtually compels plaintiffs' lawyers to use experts who will distort the available scientific evidence.").
blamed, however, for his attempt to distort the debate by creating the impression that the imposition of liability on enterprises for their products and by-products has been based on bad science, and worse, that the proponents of enterprise liability are responsible for bad science in the courtroom.

The fact that judges usually succeed in keeping junk science out of the courtroom does not mean that junk science is not a problem. Huber is probably correct that fear of liability is keeping some safe and useful products off the market. For example, the recent $5.1 million verdict against Ortho Pharmaceutical Corporation for birth defects supposedly caused by its spermicide was procured with expert testimony based on a preliminary study that subsequently was repudiated by its authors. Though its scientific basis is questionable, the verdict has raised concern about the continued availability of such products.

Because contraception, pregnancy, and childbirth are the source of peculiar risks and immense liability exposure, women are likely to be the principal victims of corporate fear of legal liability. The threat of liability arguably has already deprived American women of safe and effective birth control by temporarily driving safe IUDs off the market, deprived them of a drug (Bendectin) that would relieve severe symptoms of morning sickness during pregnancy, and subjected them to unnecessary Caesarean-section operations prompted by false distress signals from electronic fetal monitoring during labor.

Corporate fears ought to be allayed by recent legal developments. In chapter eleven of Revenge, "Stopping Points," Huber applauds the courts and legislatures that have adopted various measures aimed at keeping junk science out of the courtroom or minimizing the likelihood of erroneous verdicts based on junk science. The Bendectin litigation has provided the federal courts with an opportunity to experiment with a variety of doctrinal devices for precluding awards based on controversial scientific evidence, most of which have resulted in dismissal of the plaintiffs' cases.

Revenge has succeeded in heating up the debate about the legal system's response to controversial scientific evidence, but it fails to illuminate the difficult doctrinal dilemma confronting the courts. In his fanatic devotion to Frye, Huber essentially has ignored the various criticisms of the rule that led many courts to reject or modify it in

76. This chapter is reproduced almost verbatim as the second half of Huber's law review adaptation. Huber, supra note 28, at 739-55.
Several years ago, a distinguished group of symposium participants "reached a consensus that the screening function of Frye should be retained, but that the wording should be improved to promote clarity in the procedure and certainty in its effect." Even the President's Council on Competitiveness departed from Frye's strict "general acceptance" standard and would have allowed testimony based on "widely accepted" theories that could include "respected minority" viewpoints. Huber is so result-oriented that he applauds every "strict scrutiny" opinion that bars recovery by a plaintiff, and he fails to recognize that these opinions are inconsistent with the FRE and with each other. Revenge is therefore of no value to the Justices of the Supreme Court who will decide Daubert or to anyone contemplating a revision of the rules of evidence to refine the standards governing admissibility and presentation of expert testimony.

No matter how effective the courts may be in keeping junk science out of the courtroom, citizens and consumers will be deprived of safe or affordable products if corporate executives are deluded into believing that their enterprises face a serious threat of liability for tragedies they did not cause. Existing corporate concerns about the liability system may well be irrational or exaggerated, and Revenge seems calculated to encourage a paranoid perspective.

Elsewhere, Huber has noted: "Junk science's one very real power is to stir up fear." In Revenge, Huber harnesses the power of junk science to promote a paranoid perspective.

This review is not the place for a reiteration of the debate over the merits of the Frye rule and its role within the FRE. Judge Becker ably summarized the arguments for adoption of the competing relevancy test in United States v. Downing, 753 F.2d 1224 (3d Cir. 1985), and Judge Stapleton carefully applied the test to the Bendectin litigation in DeLuca v. Merrell Dow Pharmaceuticals, Inc., 911 F.2d 941 (3d Cir. 1990). I am not alone in finding these opinions persuasive. See, e.g., Weinstein & Berger, supra note 23; McCarthy, supra note 4. My only reservation is that not all trial judges are capable of rigorously applying the relevancy test as described in these two opinions. The question remains whether the costs of litigation under the more flexible relevancy test (i.e., an occasional "erroneous" verdict, the added cost of litigating cases that otherwise would have been dismissed earlier in litigation, and the chilling effect from the threat of litigation and erroneous verdicts under such a rule) outweigh the costs of error and unfairness from rigid application of the Frye rule in civil litigation.

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79. See Hensler, supra note 10, at 247; Quayle, supra note 12, at 566.

80. For a persuasive critique of the leading opinions, see McCarthy, supra note 4.


82. Huber, supra note 28, at 754 (discussing the debilitating effects of phobias induced by public belief in pseudoscience).
litigation science to stir up fear of the tort system, purveying the pernicious myth that junk science is rampant in our courts and that liability frequently is imposed without a well-founded scientific basis.