Daubert: Worldwide Judicial Management of Humanity's Specialized Knowledge

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In the never-ending effort to make sense of the universe, the human brain long ago bumped up against its limits. Brains learned to amplify themselves with pencils and paper, slide rules, calculators, and electronic computers. [1]

Now, with the explosion of new information, each of us can acquire only a scintilla of what is available. We are constantly struggling to retain a tenuous understanding of the swiftly changing world about us — scientific, sociological, and institutional. [2]

INTRODUCTION

In the extraordinary Symposium examining the worldwide phenomenon of increased use of scientific evidence,[3] we witness compelling evidence of a worldwide intellectual and cultural revolution unfolding in our legal systems concerning the use of expert and scientific evidence. We must attribute this turn of events, at least in significant part, to the United States Supreme Court's landmark decision in *Daubert v. Merrell Dow Pharmaceuticals, Inc.*[4]

Apart from the very event of this Symposium, I shall justify my seemingly bold references to a "worldwide" intellectual and

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[1] George Johnson, *Quantum Computers to Make Great Leap*, CHARLESTON GAZETTE, Feb. 23, 1997, at 3C.

[2] Jack B. Weinstein, *Learning, Speaking, and Acting: What Are the Limits for Judges?*, 77 JUDICATURE 322, 322 (1994).

[3] Symposium, *International Perspectives on Scientific Evidence*, 30 U.C. DAVIS L. REV. 941 (1997).

[4] 509 U.S. 579 (1993).

cultural revolution by showing that *Daubert* will shift much attention away from collateral issues and focus it on the expert and scientific evidence that often controls the outcome of a case:

> The one conclusion that can be drawn with confidence from [*Daubert*] is that it will entail the legal profession confronting scientific reasoning and developments in a context in which there is no escape from the scientific fundamentals and complexities. It is going to require a sophistication in matters scientific from advocates and judges alike that has neither been displayed nor generally regarded as needed until now.[5]

Daubert will have this revolutionary effect — on the bench and the bar — precisely because it "clearly requires trial judges to subject expert testimony to more penetrating pretrial scrutiny."[6] Not only must judges subject expert testimony to more penetrating pretrial scrutiny, but they now must "reach and articulate their admissibility determinations in a more thoughtful, analytical manner."[7]

These are the two keys to the now-unfolding revolution in practice and procedure. *Daubert* not only rationalizes the task at hand by providing trial judges with an analytical framework, but it also requires judges to articulate their reasoning on critical admissibility determinations.[8]

With any true intellectual or cultural revolution, we find a shift in the "loci of commitment" brought to the subject at

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[5] Ian Freckelton, *Science and the Legal Culture*, 2 INT'L DIG. HUM. BEHAV. SCI. & L. 107, 112 (1993).

[6] *Standards and Procedures for Determining the Admissibility of Expert Evidence After* Daubert, 157 F.R.D. 571, 571 (1994) [hereinafter *Admissibility of Expert Evidence*].

[7] *Id.* at 575. *See* Bert Black et al., *Science and the Law in the Wake of* Daubert*: A New Search for Scientific Knowledge*, 72 TEX. L. REV. 715, 743 (1994).

> The great *Frye* debate notwithstanding, the real difference in scientific evidence cases is not general acceptance versus relevance/reliability, but whether or not the court is willing to undertake a thorough and active review. Courts that want to dig into the details of an expert's reasoning and the validity of her testimony can do so with or without *Frye*.

Id.

[8] Thus, like Federal Rule of Civil Procedure 54, which requires findings of fact and conclusions of law in a bench trial, *Daubert* will, in effect, prompt judges to focus on the issues. Other rules have the same objective. *See, e.g.*, FED. R. CIV. P. 56(d) (providing that if case is not fully resolved on motion for summary judgment, court should "make an order specifying the facts that appear without substantial controversy . . . and directing such further proceedings in the action as are just").

hand.[9] In the context of a jurisprudential revolution, it means, in effect, that we consider evidence under a new methodology, and we understand why it is necessary to do so. The new loci of commitment required by the *Daubert* revolution are the judiciary's meaningful examination and explanation of expert and scientific evidence. And, of course, the process will require new skills and energy from trial attorneys and barristers.

Before proceeding to complete the predicates of this argument, I pause to address some recurring themes of the Symposium. I do so because they detract from the significance of *Daubert*, and it is better to dispose of them first.

A. "The Legal Standard of Admissibility"

Many participants in the Symposium naturally focused on specific aspects of *Daubert*, particularly the Court's holding in Part I of its opinion that the "general acceptance test" of *Frye v. United States*[10] did not survive the 1975 adoption of the Federal Rules of Evidence.[11]

While I understand the academic interest in the technical holding of *Daubert* (Part I), we devoted far too much attention to this dry aspect of the case. In truth,

> the technical "holding" of *Daubert* is its least interesting aspect. For most purposes, particularly toxic torts, *Frye* was already dead on arrival at the Supreme Court. Thus, for the most part, *Daubert* simply represents the official death certificate.

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[9] An intellectual or cultural revolution typically entails a paradigmatic shift in both theoretical beliefs and methodological practices. *See* THOMAS S. KUHN, THE STRUCTURE OF SCIENTIFIC REVOLUTIONS 16-17, 43 (2d ed. 1970). In other words, it shifts the "loci of commitment" that are brought to the issue or problem at hand. *Id.*

[10] 293 F. 1013 (D.C. Cir. 1923).

[11] This, of course, was the technical question that the Court certified for review. For excellent analyses of *Daubert*, see generally Black et al., *supra* note 7 (discussing new *Daubert* standard governing admissibility of scientific evidence); Edward J. Imwinkelreid, Frye's *General Acceptance Test vs.* Daubert's *Empirical Validation Standard — "Either . . . or" or "Both . . . and"?*, 33 CRIM. L. BULL. 72 (1997) (arguing that commentators misplace focus of debate by assuming that state courts must accept either general acceptance test or *Daubert* "empirical evaluation" test, even though tests are not mutually exclusive); Edward J. Imwinkelried, *Evidence Law Visits Jurassic Park: The Far-Reaching Implication of the* Daubert *Court's Recognition of the Uncertainty of the Scientific Enterprise*, 81 IOWA L. REV. 55 (1995) (discussing *Daubert* as new federal standard in determining admissibility of scientific evidence).

> What has replaced *Frye* — the Court's interpretation of the federal rules and their application — is far more important. The Court effectively empowered trial judges to *actively* screen out unreliable expert and scientific evidence. This aspect of *Daubert* . . . will *revolutionize* practice and procedure in this field, and the "death of *Frye*" will eventually be seen as a great episode of creative destructionism.[12]

Let us also not forget that intellectual revolutions are neither made nor consolidated overnight. They often require generations to take hold. Perhaps one important piece of anecdotal evidence — first made public during our Symposium — shows how the *Daubert* revolution is already taking hold.

B. Daubert *on Remand*

One of the Symposium participants, the Honorable Alex Kozinski,[13] wrote the Ninth Circuit decision in *Daubert* that the Supreme Court reversed.[14] He also wrote the Ninth Circuit's opinion on remand — and not surprisingly, he reached the same result.[15]

During the Symposium, Judge Kozinski expressed his continuing preference for the *Frye* rule. Indeed, one cannot read his opinion on remand without detecting some hostility to the new standard of *Daubert*, which the Supreme Court directed the Ninth Circuit to apply. But in an aside, he gave away the ranch.

What Judge Kozinski told us about how he and his colleagues decided the case on remand is most informative. Circuit courts, as he noted, usually remand cases of this sort to the District Court. But this Ninth Circuit panel chose otherwise. As he put it, Judge Kozinski and his colleagues carefully scrutinized the scientific evidence in the record. They looked at each expert's "opinion" in light of the scientific evidence and the coherence, validity, and relevance of the proffered testimony.

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[12] Marc S. Klein, *The Revolution in Practice and Procedure: "*Daubert *Hearings"*, 1 SHEPHARD'S EXPERT & SCI. EVIDENCE Q. 655, 656 (1994); *see also* Marc S. Klein, *After* Daubert*: Going Forward with Lessons from the Past*, 15 CARDOZO L. REV. 2219 (1994) (demonstrating how bizarre "scientific" findings in courtroom may be attributed to potent combination of judicial scientific illiteracy and deeply flawed judicial fact-finding methodology).

[13] *See* Alex Kozinski, *Brave New World*, 30 U.C. DAVIS L. REV. 997 (1997).

[14] Daubert v. Merrell Dow Pharms., Inc., 951 F.2d 1128 (9th Cir. 1991).

[15] Daubert v. Merrell Dow Pharms., Inc., 43 F.3d 1311 (9th Cir. 1995).

In other words, on remand, Judge Kozinski and his colleagues engaged in and applied the *Daubert* process. It may have required a "deep breath" before they proceeded with this "heady task."[16] But the rubber stamp of *Frye* stayed in its drawer; instead, the judges applied their intellects.

So, in discussing "How the *Daubert* Case Should Have Been Decided" (Part I of the Symposium), the answer is clear. Exactly as it was decided — on remand.[17]

C. Forensic Pessimism

Most participants in the Symposium spoke of problems plaguing so-called "forensic evidence" throughout the world. Many were pessimistic. Some said it is a sham to even call forensic investigation "science" at all.[18]

Throughout the world, forensic science has, perhaps deservedly, been roundly criticized. Our O.J. Simpson case highlighted gross inadequacies in our own crime laboratories.[19] Scandals of forensic science in Europe have recently added to "the roll-call of miscarriages of justice committed by the legal establishment" toward unfavored groups like the Irish Republican Army.[20]

But there is no reason for pessimism, unless we are willing to accept something less than the rule of law. The problems are not technologically insurmountable. It is a question of funding,

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[16] *Id.* at 1316.

[17] *Id.* at 1317 ("We have examined carefully the affidavits proffered by the plaintiffs' experts, as well as the testimony from prior trials that plaintiffs have introduced"). The balance of the opinion analyzes the scientific evidence — rather than resorting to the rubber stamp of *Frye*. *Id.* at 1318-22.

[18] Already, *Daubert* is forcing a long-overdue re-examination of what passes for forensic science. *See, e.g.*, United States v. Rouse, 100 F.3d 560, 567-68 (8th Cir. 1996) (using *Daubert* principles to re-examine reliability of psychological and other testimony used to convict alleged child molesters and impose life sentences), *reh'g en banc granted*, 107 F.3d 557 (8th Cir. 1997); *see also* Williamson v. Reynolds, 904 F. Supp. 1529, 1555-58 (E.D. Ok. 1995) (granting writ of habeas corpus on ground that prosecution's purported scientific evidence, hair analysis, could not pass muster under *Daubert*).

[19] Even our once highly esteemed FBI criminal lab has been found wanting. *See, e.g.*, *FBI's Crime Lab Mess*, NEW ORLEANS TIMES-PICAYUNE, Feb. 3, 1997, at B4 (reporting alleged inaccuracies in FBI forensic crime laboratory analysis); *50 Prosecutors Advised of FBI Lab Errors*, N.Y. TIMES, Feb. 13, 1997, at A18 (reporting errors in FBI forensic crime laboratory analyses).

[20] Owen Bowcott, *The* Bridgewater *Case: List of High-Profile Wrongful Convictions Lengthens*, GUARDIAN (London), Feb. 21, 1997, at 2.

and our commitment to use science for good rather than evil.[21] So rather than dwell in fatalistic pessimism, those who labor in this field should get to work, get the necessary funding, and clean it up.[22]

D. America's "Jury System" Is Not To Blame

Some of our European colleagues suggested that all is well in their nations.[23] To the extent that problems exist with expert and scientific evidence, they suggested, those problems must be "made in America" and have something to do with our unique "jury system." These views are both naive and chauvinistic and ones that our good friends can no longer afford to entertain too seriously.

Our "jury system" is not the problem. Whether criminals are tried by judges or juries in any country committed to the rule of law matters less than whether we utilize our "specialized knowledge" to get the right result.[24] Likewise, in civil adjudication, our worlds are converging:

> With similar sets of basic legal standards, the question is whether the American system of resolving product liability claims and systems elsewhere for dealing with them will grow

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[21] *See* Marc S. Klein, *The Case for More Law in Science*, 2 SHEPARD'S EXPERT & SCI. EVIDENCE Q. 11, 11 (1994) (quoting Rodney W. Nichols, *Two, Four, Six, Eight: Progress?*, SCIENCES, July/Aug. 1994, at 4) ("The tools of technology have been applied both for good and evil. The sad experience of the twentieth century shows that abuses of power are more horrific when they are perpetrated by technologically sophisticated regimes. And sometimes a beneficial technological tool gives rise to unintended adverse effects.").

[22] Openness promotes accountability and reform when appropriate. Revelations of forensic incompetence in "high-profile" criminal cases, like the O.J. Simpson case and the Oklahoma bombing case, may thus serve useful purposes. *See* People v. Simpson, No. BA097211 (Cal. Super. Ct. L.A. County 1995); United States v. McVeigh, No. 96-CR-68, 1996 U.S. Dist. WL 198147, at *1 (D. Colo. Apr. 24, 1997). As Barry Scheck recently noted: "I do see one very positive development that has emerged from the Simpson case — a strong effort in the forensic science community to formulate and improve the professional standards of crime laboratories and criminalists." Barry Scheck, *Tried and True*, NEWSWEEK, Feb. 17, 1997, at 32, 35. He concluded: "An independent, well-financed and highly competent crime laboratory provides our best assurance that the truly innocent will be exonerated and the truly guilty will be convicted." *Id.*

[23] *See* Petra van Kampen & Hans Nijboer, Daubert *in the Lowlands*, 30 U.C. DAVIS L. REV. 951, 983-88 (1997).

[24] There have been some world-class scandals in Europe arising from the abuse of forensic evidence. These cannot be blamed on juries but rather on the fact that legal systems are operated by fallible human beings.

> closer or remain quite different. . . . [O]ver the long term, they will converge. Historically, international commerce has driven cultural convergence. When people trade with one another, they visit and communicate with each other. As a result, they grow closer. (Thus, it is not too difficult to see American-style fast food operations throughout the world.) We can expect this type of harmonization (homogenization) among the world's legal systems as well. In fact, many of the product liability lawsuits now pending in Europe, Canada, Japan, and elsewhere mirror product liability cases pending here. We see the same theories involving the same (or substantially similar) products.
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> . . . . With new information technologies, including the Internet, we will soon see lawyers from different countries regularly communicating with one another. They will share strategies and discovery information on a global basis.[25]

The key point here is that judges throughout the world must now properly use humanity's "specialized knowledge" to further, and not to retard, the rule of law and the maturation of mankind.

I. HUMANITY'S SPECIALIZED KNOWLEDGE

> What, then, is knowledge? One answer is this: knowledge is true justified belief that was acquired by a method that was, in context, reliable. A subject's belief counts as knowledge when they have good reason to have that belief, the belief is true, and it was acquired by a method that was, in context, reliable.[26]

Our species is in a unique and extraordinary phase of its evolution and development. At an unprecedented rate, we are expanding our knowledge and power — as we unfold the genome, ascertain the age of the universe, develop powerful new systems of communication, and implement advanced techniques of information management. Our funds of "specialized knowledge" are growing exponentially.[27]

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[25] Marc S. Klein, *Megatrends in International Product Liability Law*, C949 ALI-ABA 113, 122-23 (1994).

[26] KEY IDEAS IN HUMAN THOUGHT 408 (Kenneth McLeish ed., 1993).

[27] Information scientists now calculate that our composite "fund" of information doubles every seven years. One of our earlier information revolutions (resulting from Gutenberg's invention of the printing press) similarly left in its wake enormous political,

This spurt of human growth can be traced to our Age of Enlightenment — when we finally grasped the "scientific method" and committed to the power of rationality.[28] The spirit of the times quite naturally affected our thinking about adjudication as well. We abandoned primitive and less rational methods of resolving disputes (by compurgation, battle, and ordeal, for instance) for "the reasoning process of a group of rational [people] upon the information which that group had before it."[29]

Because we are now deeply committed to rational adjudication, our judicial systems are necessarily drawing on humanity's funds of "specialized knowledge." The trends correspond to the events of our times. Today, expert and scientific evidence plays a critical role in the resolution of many civil and criminal actions. Recent studies show, for example, that litigants rely on "expert testimony" in approximately eighty percent of all civil cases and a significant minority of all felony prosecutions.[30] We devote large resources to this component of dispute resolution for a good reason: we want rational and correct determinations.

The desirability of this end point becomes more compelling as we realize that, in the last half-century, we have shifted massive amounts of power to our third branch of government. Hence the decisions of courts today are far more significant than those of the past. The "typical" case of the last century

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social, and economic consequences. *See* Daniel J. Boorstin, *Widening the Communities of Knowledge, in* THE DISCOVERERS 480-556 (1985).

[28] *See generally* ISAIAH BERLIN, 4 THE GREAT AGES OF WESTERN PHILOSOPHY: THE AGE OF ENLIGHTENMENT (1956) (discussing philosophers who viewed philosophy as natural science); EDWIN ARTHUR BURTT, THE METAPHYSICAL FOUNDATIONS OF MODERN PHYSICAL SCIENCE (1927) (describing influence of science on philosophers). As Galileo Galilei insisted: "Methinks that in the discussion of natural problems, we ought not to begin at the authority of places of scripture, but at sensible experiments and necessary demonstrations." *Id.* at 72-73. The eighteenth century French chemist, Antoine Lavoisier, embraced the same fundamental principle: "We must trust to nothing but facts: these are presented to us by Nature, and cannot deceive. We ought, in every instance, to submit our reasoning to the test of experiment, and never to search for truth but by the natural road of experiment and observation." THOMAS S. KUHN, THE STRUCTURE OF SCIENTIFIC REVOLUTIONS 146-47 (2d ed. 1970).

[29] Barry M. Epstein & Marc S. Klein, *The Use and Abuse of Expert Testimony in Product Liability Actions*, 17 SETON HALL L. REV. 656, 662 (1987) (citation omitted) (tracing law's evolution toward rational systems of fact-finding).

[30] *See, e.g.*, Samuel R. Gross, *Expert Evidence*, 1991 WIS. L. REV. 1113, 1118-19 (1991) (reporting empirical survey on use of expert testimony). In the average civil case, moreover, litigants use 3.3 experts — a striking number. *See id.* at 1119.

involved one claimant and one respondent battling over one "localized" dispute. Today, many of our cases explicitly involve the "public interest" — ranging from medical ethics (the "right to die") to the propriety of marketing seemingly useful products (including medicines) throughout the world:

> The stakes in many cases . . . are substantial, not only for the litigants, but for the public at large. While resolving the "rights" of the litigants, courts define and implement fundamental public policies. Thus, we often use the fact-finding machinery of our judicial system to sort right from wrong and chart the future course of society. In doing so, we regularly rely on expert and scientific evidence to make just and factually accurate decisions fair to the litigants and true to the larger social interests at stake.[31]

If we accept these premises, then we must appreciate the real opportunity of *Daubert*. Too many commentators view *Daubert* as just another "toxic tort" or "product liability" case, a "win" for "industry" or "victims" — depending on one's agenda. This view is parochial, self-centered, and wrong. *Daubert* is an important victory for all who are committed to the rational adjudication of disputes. It represents our stand for precision and integrity in our use of "specialized knowledge" in the courtroom.[32]

For those who cling to their narrow views of *Daubert*, a simple "thought experiment" may illustrate the broader view:

CRIMINAL CASES. We must all agree on this premise: the innocent should go free and the guilty should be convicted and punished according to law. To imprison the innocent is abominable. To set free the guilty is to invite them to violate us again. If we are to use science and technology — our specialized knowledge — to make these choices, do we not want to ensure the reliability (precision) of our determinations?[33]

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[31] Marc S. Klein, *Judges and Lawyers Must Be Scientifically Literate*, 4 N.J. LAW. 216 (1995).

[32] As Chief Justice Benjamin N. Cardozo emphasized: "Fraud includes the pretense of knowledge when knowledge there is none." Ultramares Corp. v. Touche, 174 N.E. 441, 444 (N.Y. 1931).

[33] *See* P.L. Wyckoff, *Failed Test Forces a Review of Cases*, STAR LEDGER, June 1, 1996, at 1.

> Scientific evidence in more than 175 murder, sexual assault, and other serious criminal cases around the state [of New Jersey] will have to be reviewed after a State Police forensic scientist failed a surprise proficiency test, officials admitted yesterday . . . . The cases involve tests for "genetic markers handled by the scientist, a 16-year veteran."

INTELLECTUAL PROPERTY CASES. New discoveries in science, technology and medicine are coming at an ever increasing pace. So too are disputes over who shall profit from these advances. Without appropriate legal protection for the rights of those who create them, "organized scientific and technological research could become fragmented, and society, as a whole, would suffer."[34]

Our courts are now deluged with cases involving rights to new technologies. Many of these cases involve complicated scientific, technological, medical, sociological, and ethical issues — as well as the very meaning of creativity itself.[35] Is it not painfully obvious that if our courts cannot decide these cases correctly — with a reasonable degree of precision — then society, as a whole, will suffer?[36]

PRODUCT LIABILITY. We use our product liability law to regulate the marketplace of consumer goods.[37] Bad products — those that (on balance) do not help us but rather hurt us —

Id.

[34] Kewanee Oil Co. v. Bicron Corp., 416 U.S. 470, 486 (1974). In fact, the unseemly squabbling between the Pasteur Institute of France and Robert Gallo of the NIH over credit for isolating HIV may have delayed real scientific progress in this area for more than a year. *See, e.g.*, Jocelyn Kaiser, *The "Gallo Case": Popovic Strikes Back*, SCIENCE, Feb. 14, 1997, at 920-21 (discussing investigation of Gallo employee by Department of Health and Human Services Office of Research Integrity).

[35] *See* Lotus Dev. Corp. v. Borland Int'l, Inc., 49 F.3d 807 (1st Cir. 1995) (considering ability to copyright computer software and discussing "look and feel"), *aff'd mem.*, 116 S. Ct. 804 (1996). The problems are compounded immeasurably because our substantive law naturally lags behind our technology. *See* Phillip Elmer-DeWitt, *Nabbing the Pirates of Cyberspace*, TIME, June 13, 1994, at 62 (noting legal problems in preventing unauthorized software duplication, since "[t]he underlying difficulty . . . comes from trying to guard intangible electronic 'property' using laws that were crafted with printing-press technology in mind").

[36] The problems will become more international, and less parochial, as our globe shrinks. *See, e.g.*, Peter H. Lewis, *Judges Turn Back Law to Regulate Internet Decency*, N.Y. TIMES, June 13, 1996, at A1, A6 (describing federal court decision, in *ACLU v. Reno*, 929 F. Supp. 824 (E.D. Pa. 1996), which overturned regulation of world-wide internet); *see also* Marc S. Klein, *The Importance of Good Law for Cyberspace*, N.J. LAW., Sept. 1996, at 9 (discussing federal court decision in *UCLA v. Reno* which struck down key provisions of law regulating internet).

[37] *See* BARRY M. EPSTEIN ET AL., NEW JERSEY PRODUCT LIABILITY LAW § 1.05 (1994) ("Product liability law, like all of tort law, is expressly designed to serve a regulatory function, i.e., to alter human behavior in a way favored by public policy. . . . [Courts] intentionally use the levers of liability to provide manufacturers with a suitable 'incentive' to make safer products.").

should be redesigned, if possible, or driven from the market. But, on the other hand, we have seen too many good products driven from the market, and vast social resources wasted in the process of "litigating" claims based on pathologic science. Shall we effectively permit an imprecise system to deprive ourselves of important (often lifesaving) products?[38]

FAMILY LAW CASES. In family, domestic relations, and juvenile courts throughout the nation, lives hang in the balance. We are now beginning to decide whether families shall remain together, or whether a parent's rights shall be terminated, based on what seems to be new areas of "specialized knowledge."[39] In deciding the lives of these people, can we afford too many fundamental mistakes in distinguishing real knowledge from the pretense of knowledge?

You may consider this point of precision in any area of the law and you will find the stakes too large for bad information (the pretense of knowledge) to drive our decision making. Indeed, in the years to come, the legal community will be required to play a greater role in regulating the course and integrity of the scientific enterprise itself.[40]

So we must make proper use of our specialized knowledge in litigation — the arena in which we, as a society, have chosen to

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[38] *See, e.g., On the Needless Hounding of a Safe Contraceptive*, ECONOMIST, Sept. 2, 1995, at 75 (stating that while Norplant has been safely used throughout world for 25 years, once introduced in America, product liability litigation immediately followed, and "[t]he effect on the development of other contraceptives could be devastating"). The Federal Judicial Center's Manual on Scientific Evidence is already proving its worth in this and other domains. *See, e.g.*, Grimes v. Hoffman-LaRoche, Inc., 907 F. Supp. 33, 38 (D.N.H. 1995) (relying on guidelines of Federal Judicial Center's Manual to conclude that plaintiff's claim involving Accutane could not satisfy *Daubert* criteria).

[39] *See, e.g.*, S.V. v. R.V., 933 S.W.2d 1, 8-22 (Tex. 1996) (discussing admissibility of "repressed memory" evidence in divorce case); *see also* Borawick v. Shay, 68 F.3d 597, 597 (2d Cir. 1995) (discussing "hypnotically refreshed recollections" of child abuse); United States v. Brown, 891 F. Supp. 1501, 1502 (D. Kan. 1995) (discussing "battered woman syndrome").

[40] Carl Sagan hits the nail on the head in his latest book. *See* CARL SAGAN, THE DEMON-HAUNTED WORLD: SCIENCE AS A CANDLE IN THE DARK (1996) ("In every country we should be teaching our children the scientific method and the reasons for a Bill of Rights."); *see also* Marc S. Klein, Daubert v. Merrell Dow Pharmaceuticals: *Toward a Better Relationship Between Law and Science*, 4 J. ACCOUNTABILITY RES. 9, 17 (1995) (stating that science and law are both "committed to human progress through rationality. But both are served by fallible human beings. This alone justifies the greater involvement of these two fields in each other's domain. Law and science will thus become increasingly dependent on one another as we strive to fulfill our worthy objectives.").

resolve many of our important disputes, civil and criminal. It is critically important to the litigants and the larger social stakes implicated by their dispute. If we fail on this score, moreover, then "confidence in the judiciary will be undermined as the public becomes convinced that the courts as now constituted are incapable of correctly resolving some of the most pressing legal issues of our day."[41]

The ultimate conclusion of this argument is now at hand: judges and lawyers can no longer avoid the essence and methodologies of humankind's "specialized knowledge." We have no choice. Without a doubt, the social, economic, and political forces in play (or, as Holmes put it, the "felt necessities of the time"[42]) will force our "legal culture" to adjust itself to the tasks at hand. The *Daubert* revolution is inevitable and already underway.

II. SPECIALIZED KNOWLEDGE IN JUDICIAL PROCEEDINGS: *DAUBERT*'S CONTRIBUTION

Beyond any doubt, the key phrase of Rule 702 (and its state law analogous) is "specialized knowledge."[43] Science is but one type of specialized knowledge.[44] And even then, we have no bright-line test to distinguish "science" from other forms of "specialized knowledge."[45]

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[41] William W. Schwarzer, *Management of Expert Evidence, in* REFERENCE MANUAL ON SCIENTIFIC EVIDENCE 1, 2 (1994) (quoting CARNEGIE COMMISSION ON SCIENCE, TECHNOLOGY & GOVERNMENT, SCIENCE AND TECHNOLOGY IN JUDICIAL DECISION MAKING 11 (1993)).

[42] O.W. HOLMES, JR., THE COMMON LAW 1 (1881).

[43] *See* FED. R. EVID. 702 ("If scientific, technical, or other specialized knowledge will assist the trier of fact to understand the evidence or to determine a fact in issue, a witness qualified as an expert by knowledge, skill, expertise, training, or education, may testify thereto in the form of an opinion or otherwise.").

[44] Both logic and the language of Rule 702 compel this conclusion. The terms "scientific, technical, or other specialized" are all clearly *adjectives* of "knowledge." The reference to "*other* specialized knowledge" necessarily implies that "scientific" and "technical" knowledge are but two types of "specialized knowledge." *See id.*

[45] The term "science" derives from the Latin *scientia* — literally, "knowledge." *See* WEBSTER'S THIRD NEW INTERNATIONAL DICTIONARY 2032 (1993). The concept of "science" as some unique enterprise occupied by our modern vision of "scientists" is a new conceptualization. *See* JACOB BRONOWSKI, THE COMMON SENSE OF SCIENCE 5 (1950) ("Science is not a special sense. It is as wide as the literal meaning of its name: knowledge. The notion of the specialized mind is by comparison as modern as the specialized man, 'the scientist,' a word which is only a hundred years old.").

Thus, it should be clear by now that *Daubert* is not "limited" to "scientific evidence," but applies to every type of specialized knowledge offered in a court of law. Properly understood, *Daubert* holds that when an "expert" offers some type of specialized knowledge, her opinion must be justifiable within the standards of that field of specialized knowledge.

Throughout the world, cases involving expert testimony "arise across the entire spectrum of litigation."[46] The key is the concept of "specialized knowledge" — and the range of humanity's specialized knowledge is immense:

> The range of subject matter addressed by expert evidence is virtually limitless. It covers the spectrum of the various sciences (both so-called hard and soft sciences), and it extends to other areas of technical or specialized knowledge in which people who have acquired special knowledge, skill, experience, training, or education may be able to give testimony that would assist in the resolution of disputed questions of fact.[47]

Trial judges must ensure that any and all expert testimony "is not only relevant, but reliable."[48] Furthermore, in determining this critical question of reliability, trial judges must consider "the reasoning or methodology underlying the testimony."[49] To say that judges must now actively screen out unreliable expert testimony is one thing. Proper execution is quite another. So now that we understand what trial judges must do, we must understand how they can perform the task effectively. The question is not one of scientific methodology, but judicial methodology.[50]

The key is early and meaningful engagement. By its own terms, *Daubert* emphasizes "the importance of a pretrial procedure by which the trial judge gathers the necessary information and evaluates both the reliability of the underlying principles and methodology employed by the proposed expert witness and

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[46] Schwarzer, *supra* note 41, at 1.

[47] *Id.* at 13.

[48] Daubert v. Merrell Dow Pharms., Inc., 509 U.S. 579, 589 (1993).

[49] *Id.* at 592-93.

[50] *See, e.g.*, Margaret A. Berger, *Procedural Paradigms for Applying the* Daubert *Test*, 78 MINN. L. REV. 1345, 1352-86 (1994) (describing procedural and policy objectives that courts should consider); *Admissibility of Expert Evidence*, *supra* note 6, at 575-77 (discussing standard for admissibility of expert evidence after *Daubert*).

the potential relevance of the proposed evidence."[51] Experienced trial lawyers know that, in the midst of trial, judges cannot first be asked to consider complex questions of admissibility.

In managing expert evidence, judges must engage in at least four distinct processes. Judges must: (1) assess the case; (2) define the issues; (3) narrow the issues; and (4) limit or restrict nonessential expert testimony. From the start of the case through its conclusion, the critical task is "to identify the issues that divide opposing experts."[52]

This undertaking cannot be a superficial one. Judges must drill down beyond ostensible differences presented by the litigants:

> If the process of issue definition is to be effective, it should not stop with a general statement of the experts' disagreement. The court should . . . probe deeper to identify the bases for their differences . . . . Closer examination of the bases of their respective positions may well disclose that their differences are the products of different starting points.[53]

When a trial judge actively probes deeper to identify the bases for experts' disagreements, she will, in effect, be engaged in the *Daubert* process — closely examining "the reasoning or methodology underlying the testimony."[54] The process requires a hard look at each link in the chain:

> The conclusions of a witness offering scientific testimony will generally be the product of a multistep reasoning process. By breaking down the process, the judge may be able to narrow the dispute to a particular step in the process, and thereby facilitate its resolution.[55]

If the *Daubert* revolution is to take hold, then we (judges and advocates who labor for rationality in our society) must understand, live, and communicate our passion for it.[56] If the witness is a "scientist" purporting to express a "scientific opinion" — as we understand science today — then courts must measure the

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[51] *Admissibility of Expert Evidence*, *supra* note 6, at 580.

[52] Schwarzer, *supra* note 41, at 16.

[53] *Id.*

[54] *Daubert*, 509 U.S. at 592-93.

[55] Schwarzer, *supra* note 41, at 17-18.

[56] Klein, *supra* note 31, at 216.

reliability of that opinion against the criteria of the modern scientific method (falsifiability, peer review, publication, general acceptance, and all other relevant criteria). These criteria of good science are not "the *Daubert* criteria." Rather, they represent an application of the *Daubert* criteria (relevance and reliability) in the context of one form of specialized knowledge — what we call "science."[57]

By contrast, if the "expert" is an automobile mechanic called to share his "specialized knowledge" of engine repair, the *Daubert* criteria still apply. This does not mean, however, that the mechanic's opinion has to have been published in a peer reviewed journal, replicated, or "generally accepted." But it should ensure that the automobile mechanic formed his opinion consistent with the methodology of mechanics who actually repair engines in the "real world."[58]

III. JUDICIAL ACCOUNTABILITY

As litigation has grown more complex and expansive, the very nature of "judging," and our conception of it, has changed. We

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[57] Even then we must distinguish among the various "sciences" — whether we choose to categorize them as "hard vs. soft" or otherwise. *Daubert* involved the science of birth defects (teratology). Not every "science" will necessarily involve each of the four general criteria of science mentioned in *Daubert* — "publication" or "peer review," for example. This is precisely why the Supreme Court eschewed any "definitive checklist" of criteria of "good science" and instead emphasized that "[t]he inquiry envisioned by Rule 702 is . . . a flexible one." *Daubert*, 509 U.S. at 593-94.

[58] There is no shortage of published manuals, for example, that demonstrate how particular engines are to be repaired and estimate the length of time that these jobs should take. Cases suggesting that the *Daubert* criteria are limited only to "scientific evidence" just do not understand "the *Daubert* criteria" (relevance and reliability).

For an example of one recent decision entirely misconstruing not only *Daubert*, but the meaning of knowledge itself, see *Compton v. Subaru of America, Inc.*, 82 F.3d 1513, 1518-19 (10th Cir. 1996). In *Compton*, an automobile design defect case, the court suggested that *Daubert* does not apply "in cases where expert testimony is based solely upon experience or training." *Id.* at 1518. And why is that? Because the court reasoned that, in those instances, the expert is not offering testimony "based upon a particular methodology or technique," but rather on her "experience or training." *Id.* at 1518-19.

The point, however, is this: as a result of the expert's "experience or training," she must have developed a "methodology or technique." Now if she cannot articulate what it is, and how it supports her conclusion in the case, *then* we are not dealing with "specialized knowledge." Rather, we are dealing with speculation, conjecture, personal beliefs — *ipse dixit* ("because I said so") opinions — and we shall be back to square one, where the expert is free to say anything so long as she is "qualified" by "experience or training."

have, in many important ways, departed from the ancient "umpirial view" of the judge to a "managerial model."[59]

Under the umpirial view, well suited for simpler times, judges presided like neutral umpires over the course of a litigation. Cases were left to the control of the litigants and their counsel. Judges would "rule" on disputes presented to them during pretrial or trial proceedings.[60]

The managerial model, by contrast, puts the judge at center stage. He often controls pretrial proceedings, including the nature and course of discovery, and shapes the essence of the litigation. It is a powerful position. A judge's decision to foreclose a line of discovery, although seemingly procedural, can effectively be dispositive of a theory or claim.

Daubert represents another dramatic advance in the direction of managerial judging. No case, no matter how seemingly simple, is necessarily exempt.[61] Thus, concerning our use of specialized knowledge, we may no longer properly conceive of the trial judge as "a mere umpire."[62] Rather, *Daubert* has "'broadened and sharpened the trial judge's gatekeeper role to determine whether an expert's testimony both rests on a reliable foundation and is relevant to the task at hand.'"[63]

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[59] The inception of managerial judging has generally been traced to the adoption of the "modern" Federal Rules of Civil Procedure in 1938. *See, e.g.*, E. Donald Elliott, *Managerial Judging and the Evolution of Procedure*, 53 U. CHI. L. REV. 306, 307 (1986) (tracing evolution of managerial judging doctrine to flaws in Federal Rules of Civil Procedure); Judith Resnik, *Managerial Judges*, 96 HARV. L. REV. 374, 391-92 (1982) (tracing managerial judging to Federal Rules of Civil Procedure that were enacted in 1938).

> Before the Federal Rules of Civil Procedure were adopted, parties preparing for trial were generally left to their own devices. Creation of the new discovery rights, however, shifted the locus of pretrial preparation. Litigants became entitled to the court's help in obtaining from each other all unprivileged information "relevant to the subject matter" of the lawsuit. Thus, the domain of trial judges grew.

Id. (citations omitted).

[60] *See* Resnik, *supra* note 59, at 383-86 (detailing role of federal judges in traditional model).

[61] While it is true that "[t]he nature and degree of judicial management appropriate for the case will vary greatly with its particular circumstances," the fact that "the court has before it a seemingly ordinary single-plaintiff personal injury case . . . does not foreclose the presence of difficult questions of scientific proof." Schwarzer, *supra* note 41 at 14.

[62] *In re* Joint E. & S. Dists. Asbestos Litig., 830 F. Supp. 686, 692 (E. & S.D.N.Y. 1993) (quoting Scott v. Spanjer Bros., 298 F.2d 928, 930-31 (2d Cir. 1965)).

[63] *In re* Joint E. & S. Dists. Asbestos Litig., 151 F.R.D. 540, 545 (E. & S.D.N.Y. 1993)

The change is at once subtle but potent. The trial court's responsibility for preliminary fact-finding has not changed.[64] But the trial judge must now "consciously do what is in reality a basic task of a trial judge — ensure the reliability and relevance of evidence without causing confusion, prejudice, or mistake."[65] Moreover, this basic task can no longer be left to a trial judge's gestalt in the guise of "broad discretion." Rather, *Daubert* "seeks to ensure that this result is accomplished . . . through a suggested analytical framework."[66]

Now that *Daubert* has restated the trial judge's task — to articulate admissibility determinations within a given analytical framework — we can fairly expect judges to rely more often on neutral expertise, when appropriate, in performing their gatekeeping function. The real question now is not *if* but *when* courts will begin to exercise this important, but long dormant, judicial power in performing their gatekeeping function.[67]

Now, let us acknowledge that: "Man is a tool-using animal. . . . Without tools he is nothing, with tools he is all."[68] If we fail to make good use of our specialized knowledge in litigation, it will not be for the lack of means, but rather the lack of will. Trial judges clearly have "numerous tools at their dispos-

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(quoting *Daubert*, 509 U.S. at 597). The title of a law student's insightful article perhaps best captures the essence of the transformation. *See* Bonnie J. Davis, Comment, *Admissibility of Expert Testimony After* Daubert *and* Foret*: A Wider Gate, a More Vigilant Gatekeeper*, 54 LA. L. REV. 1307, 1307 (1994).

[64] Federal Rule of Evidence 104 has long required preliminary fact-finding as a prerequisite of admissibility. Moreover, all courts recognized the obligation to make some admissibility determinations under the specific rules governing expert and scientific evidence, particularly Rules 702 and 703. *See* Thomas M. Reavley, *Judicial Control of Expert Opinion After* Daubert, 3 SCI. EVIDENCE REV. (forthcoming 1997).

> Decisions of the United States Supreme Court can have a significant effect upon litigation all over the country even when the Court announces no surprises or changes in the law. *Daubert* is an example of this. We always knew that the trial judge decides whether a predicate is laid for the admissibility of expert opinion.

Id.

[65] *Admissibility of Expert Evidence*, *supra* note 6, at 577.

[66] *Id.*

[67] The change is far more *cultural* and technical. *See* Reavley, *supra* note 64 (*Daubert* "has produced important salutary results. Because of all the attention being given to expert testimony, judges are taking more care in screening those opinions.").

[68] THOMAS CARLYLE, SARTOR RESARTUS 31-32 (1831).

al . . . to crystallize and resolve issues of the admissibility of expert evidence at the earliest practicable time in a litigation."[69]

We may view the implications of the *Daubert* revolution from different perspectives. We will surely quibble over different proposals for implementing the essential reforms. But, in the final analysis, the worldwide significance of *Daubert* and the importance of reforming our means for using specialized knowledge in courts of law lay beyond dispute.

CONCLUSION

> *Through scientific discovery and technological innovation, we enlist the forces of the natural world to solve many of the uniquely human problems we face — feeding and providing energy to a growing population, improving human health, taking responsibility for protecting the environment and the global ecosystem, and ensuring our own nation's security.*[70]
>
> *We are all stakeholders in the scientific enterprise, and we must focus on a shared commitment.*[71]
>
> *[I]mproved science and mathematics education for all citizens is now recognized as a strategic imperative for our individual and collective futures.*[72]

AIDS, nuclear pollution, the integrity of food supplies, and global warming are among just a few of the many serious problems facing all who inhabit this small globe. These problems, of course, respect no international border.

We have endured with inadequate systems for using our specialized knowledge to address these problems in our legal systems for too long. Time is short. Fortunately, with the *Daubert* revolution unfolding, change is in the air.

What is amazing is the clarity of the task at hand and the fact that it has been overlooked for so long. But consider the prescient words of one legal scholar in the early 1800s:

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[69] *Admissibility of Expert Evidence*, *supra* note 6, at 586.

[70] EXECUTIVE OFFICE OF THE PRESIDENT, OFFICE OF SCIENCE AND TECHNOLOGY POLICY, SCIENCE IN THE NATIONAL INTEREST, at Preface (1994).

[71] *Id.* at 9.

[72] *Id.* at 2.

> [L]egislators, courts, and lawyers are often obliged to resort to the evidence and opinions of those who have made physics and mental philosophy their peculiar study: and it is very clear that this can be done with assurance of correctness, only when the *examiners*, as well as the *witnesses*, are in some degree enlightened on such subjects.[73]

Does *Daubert* really say anything more? I think not. It is painfully obvious that, to fulfill our professional and social responsibilities as judges and advocates, we must strive continuously to use humanity's specialized knowledge properly in the courtroom.

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[73] DAVID A. HOFFMAN, 2 A COURSE OF LEGAL STUDY 698 (1836).