

Vanderbilt University Law School

Scholarship@Vanderbilt Law

Vanderbilt Law School Faculty Publications

Faculty Scholarship

2003

Changing Scientific Evidence

Edward K. Cheng

Follow this and additional works at: <https://scholarship.law.vanderbilt.edu/faculty-publications>



Part of the [Evidence Commons](#), [Science and Technology Law Commons](#), and the [Torts Commons](#)

Recommended Citation

Edward K. Cheng, *Changing Scientific Evidence*, 88 Minnesota Law Review. 315 (2003)

Available at: <https://scholarship.law.vanderbilt.edu/faculty-publications/163>

This Article is brought to you for free and open access by the Faculty Scholarship at Scholarship@Vanderbilt Law. It has been accepted for inclusion in Vanderbilt Law School Faculty Publications by an authorized administrator of Scholarship@Vanderbilt Law. For more information, please contact mark.j.williams@vanderbilt.edu.



DATE DOWNLOADED: Wed Feb 1 12:26:47 2023

SOURCE: Content Downloaded from [HeinOnline](#)

Citations:

Bluebook 21st ed.

Edward K. Cheng, Changing Scientific Evidence, 88 MINN. L. REV. 315 (2003).

ALWD 7th ed.

Edward K. Cheng, Changing Scientific Evidence, 88 Minn. L. Rev. 315 (2003).

APA 7th ed.

Cheng, E. K. (2003). Changing scientific evidence. Minnesota Law Review, 88(2), 315-356.

Chicago 17th ed.

Edward K. Cheng, "Changing Scientific Evidence," Minnesota Law Review 88, no. 2 (December 2003): 315-356

McGill Guide 9th ed.

Edward K. Cheng, "Changing Scientific Evidence" (2003) 88:2 Minn L Rev 315.

AGLC 4th ed.

Edward K. Cheng, 'Changing Scientific Evidence' (2003) 88(2) Minnesota Law Review 315

MLA 9th ed.

Cheng, Edward K. "Changing Scientific Evidence." Minnesota Law Review, vol. 88, no. 2, December 2003, pp. 315-356. HeinOnline.

OSCOLA 4th ed.

Edward K. Cheng, 'Changing Scientific Evidence' (2003) 88 Minn L Rev 315

Provided by:

Vanderbilt University Law School

-- Your use of this HeinOnline PDF indicates your acceptance of HeinOnline's Terms and Conditions of the license agreement available at

<https://heinonline.org/HOL/License>

-- The search text of this PDF is generated from uncorrected OCR text.

-- To obtain permission to use this article beyond the scope of your license, please use:

[Copyright Information](#)

Article

Changing Scientific Evidence

Edward K. Cheng[†]

[T]he Areopagites . . . , finding themselves perplexed with a cause they could not unravel, ordered the parties to appear again in a hundred years.

—Montaigne¹

Wisdom too often never comes, and so one ought not to reject it merely because it comes late.

—Justice Felix Frankfurter²

The fiasco surrounding the silicone breast implant litigation is well known.³ In 1984, a San Francisco jury awarded a plaintiff \$1.7 million against Dow Corning for a form of autoimmune disease allegedly caused by Dow Corning's im-

[†] Assistant Professor of Law, Brooklyn Law School. J.D., Harvard Law School; M.Sc., London School of Economics; B.S.E., Princeton. I would like to thank David Rosenberg, Marty Redish, Bob Bohrer, Doug Lichtman, Albert Yoon, Margaret Berger, John McGinnis, and Jenny Diamond Cheng for reviewing and commenting on drafts; and Mike Koltonyuk, Judge Stephen Williams, Shari Diamond, Ronen Avraham, Nancy King, Louis Jacobs, Melanie Leslie, Lawrence Sager, and Jeff Morris for helpful discussions. I would also like to acknowledge the support of the Searle Fellowship at Northwestern University School of Law and the Dean's Summer Research Stipend Program at Brooklyn Law School. Many thanks to Jared Hager for excellent editorial assistance.

1. WILLIAM HAZLITT, *THE WORKS OF MICHAEL DE MONTAIGNE: COMPRISING HIS ESSAYS, LETTERS, AND JOURNEY THROUGH GERMANY AND ITALY* 504 (Charles Cotton trans., 1850).

2. *Henslee v. Union Planters Bank & Trust Co.*, 335 U.S. 595, 600 (1949) (per curiam) (Frankfurter, J., dissenting).

3. For a more detailed account of the silicone breast implant litigation, see MARCIA ANGELL, *SCIENCE ON TRIAL: THE CLASH OF MEDICAL EVIDENCE AND THE LAW IN THE BREAST IMPLANT CASE* 69–85 (1996) and David E. Bernstein, *The Breast Implant Fiasco*, 87 CAL. L. REV. 457 (1999) (reviewing ANGELL, *supra*).

plants.⁴ At the time, scientific findings on the adverse health effects of silicone were at best preliminary, consisting mainly of anecdotal reports.⁵ But litigation continued despite the absence of a substantial body of scientific data. In 1991, just one month after an advisory panel for the Food and Drug Administration (FDA) found that more research was needed to assess the safety of silicone implants,⁶ another jury awarded \$7.3 million to a plaintiff against Dow Corning for allegedly causing mixed connective tissue disease.⁷

Major medical research into the hazards of silicone implants did not even begin until 1992,⁸ when the FDA imposed an interim ban.⁹ This "time-out" at the FDA to collect epidemiological data, however, only served to fuel a subsequent explosion of litigation.¹⁰ In late 1992, a Houston jury awarded yet another plaintiff \$25 million, this time against Bristol-Myers Squibb.¹¹ Facing potentially staggering liability, Dow Corning entered into a \$4.2 billion class settlement in September 1994.¹²

Only after these massive verdicts did the scientific evidence regarding silicone breast implants become increasingly

4. Richard A. Nagareda, *In the Aftermath of the Mass Tort Class Action*, 85 GEO. L.J. 295, 331 (1996). Before the appeals stage had concluded, Dow Corning settled in an agreement that included a protective order against disclosure by the plaintiff. *Id.*

5. See ANGELL, *supra* note 3, at 52 (describing an anecdotal report from Australia of three implanted women who suffered from connective tissue disease).

6. The panel recommended, however, that silicone implants should remain on the market in the interim due to their psychological benefits for recipients. Nagareda, *supra* note 4, at 332.

7. *Id.*; see also ANGELL, *supra* note 3, at 118–25 (providing details on this second litigation).

8. ANGELL, *supra* note 3, at 27.

9. See David A. Kessler, *The Basis of the FDA's Decision on Breast Implants*, 326 NEW ENG. J. MED. 1713, 1713–14 (1992) (discussing the basis for the FDA's decision to limit access to silicone breast implants to those whose need was greatest).

10. Nagareda, *supra* note 4, at 333–34.

11. *Id.* at 334 & n.199. The award included approximately \$20 million in punitive damages. *Id.* at 334 n.199.

12. See *In re Silicone Gel Breast Implant Prods. Liab. Litig.*, No. CV94-P-11558-S, 1994 U.S. Dist. LEXIS 12521, at *1 (N.D. Ala. Sept. 1, 1994). Due to insufficiencies in the settlement fund and a high number of individual plaintiff opt-outs, the settlement subsequently unraveled, and Dow Corning ultimately filed for bankruptcy in 1995. See Heidi Li Feldman, *Science and Uncertainty in Mass Exposure Litigation*, 74 TEX. L. REV. 1, 21–22, 21 n.101 (1995) (reporting that it would cost \$7.3 billion to pay all claimants the proposed minimum payout).

clear. The first well-regarded epidemiological study was published in June 1994.¹³ Conducted by the Mayo Clinic, it found that implant recipients had no greater risk of connective tissue disease.¹⁴ Subsequent studies yielded similar results,¹⁵ and in April 1996, an exhaustive survey of the epidemiological literature definitively concluded that silicone implants presented no large increase in the risk of developing connective tissue disease.¹⁶

Other well-known mass tort litigations share striking similarities. For example, Bendectin, an antinausea drug used to treat morning sickness in pregnant women, was once suspected of being a teratogen, or cause of birth defects.¹⁷ When the first lawsuit was brought in 1977, the scientific data on Bendectin was likewise scant. The evidence consisted of some anecdotal accounts, a few animal toxicology studies, and four rather inadequate epidemiological studies.¹⁸ Yet, despite the lack of a

13. Sherine E. Gabriel et al., *Risk of Connective-Tissue Diseases and Other Disorders After Breast Implantation*, 330 NEW ENG. J. MED. 1697 (1994). Although the Mayo Clinic study appears to be regarded as the first reliable study, see, e.g., Rebecca S. Dresser et al., *Breast Implants Revisited: Beyond Science on Trial*, 1997 WIS. L. REV. 705, 712, other epidemiological studies were previously published, but perhaps are discounted as having inadequate sample sizes. See Barbara G. Silverman et al., *Reported Complications of Silicone Gel Breast Implants: An Epidemiologic Review*, 124 ANNALS INTERNAL MED. 744, 748-49 tbl.2 (1996) (surveying all epidemiological studies on silicone breast implants and connective tissue disorders).

14. Gabriel et al., *supra* note 13, at 1700; see also ANGELL, *supra* note 3, at 101.

15. See, e.g., Charles H. Hennekens et al., *Self-Reported Breast Implants and Connective-Tissue Diseases in Female Health Professionals*, 275 JAMA 616 (1996) (excluding large risks of connective tissue disease following breast implants).

16. Silverman et al., *supra* note 13, at 754-55; see also ANGELL, *supra* note 3, at 27 ("[N]one of the epidemiologic studies has been able to demonstrate a clear link between breast implants and connective tissue disease or suggestive symptoms."). Certainly, science's inability to find a link does not mean that no such link exists, particularly given the extremely high standards of proof science requires (i.e., a 95% confidence level). Nonetheless, it is safe to say that the case against silicone dramatically changed between 1992 and 1996.

17. For two excellent accounts of the Bendectin litigation, see MICHAEL D. GREEN, *BENDECTIN AND BIRTH DEFECTS: THE CHALLENGES OF MASS TOXIC SUBSTANCES LITIGATION* (1996) and JOSEPH SANDERS, *BENDECTIN ON TRIAL: A STUDY OF MASS TORT LITIGATION* (1998).

18. GREEN, *supra* note 17, at 103-06 (explaining the shortcomings of the four epidemiological studies, which suffered from small sample size and lack of specificity); SANDERS, *supra* note 17, at 66-67 tbl.1 (summarizing Bendectin animal studies). Notably, the few epidemiological studies available showed

well-developed body of evidence linking Bendectin to birth defects, some early juries found for plaintiffs.¹⁹ In May 1983, a District of Columbia jury awarded one plaintiff \$750,000.²⁰

Unlike the silicone breast implant litigation, science caught up with the courts in the case of Bendectin. Although the litigation ultimately caused Merrell Dow to withdraw Bendectin from the American market in 1983,²¹ a substantial body of evidence that the drug was non-teratogenic quickly formed,²² including findings from the drug regulatory agencies of the United States, United Kingdom, Australia, Switzerland, and Germany.²³ By 1985, nearly all of the scientific evidence had been gathered,²⁴ with the major peer-reviewed epidemiological

that Bendectin was not a teratogen. GREEN, *supra* note 17, at 103–06. The serious flaws and weaknesses in the studies, however, illustrate the considerable uncertainty surrounding Bendectin. Professor Margaret Berger has suggested that a manufacturer's failure to fully research the possible adverse effects of its products should in and of itself constitute a tort. Margaret A. Berger, *Eliminating General Causation: Notes Towards a New Theory of Justice and Toxic Torts*, 97 COLUM. L. REV. 2117, 2143–52 (1997) (recommending that general causation principles be replaced by this alternative tort regime).

19. See SANDERS, *supra* note 17, at 92–93 tbl.6 (summarizing Bendectin trial awards and ultimate dispositions).

20. *Oxendine v. Merrell Dow Pharm., Inc.*, 506 A.2d 1100, 1103 (D.C. 1986); see also *Merrell Dow Pharm., Inc. v. Oxendine*, 649 A.2d 825, 827 (D.C. 1994) (recounting the convoluted procedural history of the case).

21. PETER W. HUBER, GALILEO'S REVENGE: JUNK SCIENCE IN THE COURTROOM 127 (1991) (noting that although Merrell Dow ultimately “won pretty much everything,” it “probably spent upward of \$100 million for its vindication”).

22. See GREEN, *supra* note 17, at 314–15 (arguing that Bendectin was distinctive because by the mid-1980s, the scientific literature was “unusually rich,” consisting of “21 epidemiological studies that focused on Bendectin and 14 other studies that included Bendectin”); SANDERS, *supra* note 17, at 106 (noting that with time “the published epidemiological evidence on Bendectin more than tripled in size, substantially improved in quality, and tended to exonerate Bendectin as a teratogen”).

23. Joseph Sanders, *From Science to Evidence: The Testimony on Causation in the Bendectin Cases*, 46 STAN. L. REV. 1, 8 n.23 (1993). This group was later joined by the Canadian Ministry of Health and Welfare. *Oxendine*, 649 A.2d at 830 n.8. Bendectin continues to be used in Canada today to treat morning sickness. Sanders, *supra*, at 10. Doxylamine succinate, the most suspect ingredient in Bendectin, also continues to be used in the United States in over-the-counter cold remedies and sleeping aids. *Id.*

24. See Sanders, *supra* note 23, at 9, 30 (suggesting that as of 1993, any uncertainty regarding the teratogenic effects of Bendectin is irreducible given the state of technology). For example, as Huber notes, in the eight years following the withdrawal of Bendectin, “the Centers for Disease Control in Atlanta . . . found no significant change in the incidence of birth defects.” HUBER, *supra* note 21, at 127.

studies “unanimously conclud[ing] that Bendectin does not cause birth defects.”²⁵ The courts took note of this consensus, and increasingly granted judgments in favor of Merrell Dow.²⁶ The results, of course, could have easily been far worse. Had the evidence developed more slowly, or courts been less willing to reverse for insufficient evidence,²⁷ many judgments would have become final before a scientific consensus formed.

The problem illustrated by these two examples²⁸—namely, the problem of changing scientific evidence—has arisen time and time again over the past decades.²⁹ Each case demonstrates the legal system’s difficulty in dealing with scientific uncertainty. To be precise, at the onset one should distinguish between two types of scientific uncertainty: uncertainty regarding specific causation and uncertainty regarding general causation.

The majority of scholarly attention has focused on the difficulty of indeterminacy regarding specific causation. Traditional tort law requires a discrete, individualized harm that is causally traceable to the defendant.³⁰ Toxic torts, however, often

25. *Oxendine*, 649 A.2d at 830 n.8. For a more comprehensive picture of the scientific evidence surrounding Bendectin, see Sanders, *supra* note 23, at 18–27.

26. See, e.g., *Richardson v. Richardson-Merrell, Inc.*, 649 F. Supp. 799 (D.D.C. 1986) (granting a judgment notwithstanding the verdict for Merrell in the face of a jury award of \$1.2 million). See generally SANDERS, *supra* note 17, at 92–93 tbl.6 (summarizing trial and appellate outcomes of Bendectin litigation). Even the jury in a consolidated multidistrict litigation in Ohio returned a verdict for the defendant. *In re Richardson-Merrell, Inc. “Bendectin” Prods. Liab. Litig.*, 624 F. Supp. 1212 (S.D. Ohio 1985), *aff’d*, 857 F.2d 290 (6th Cir. 1988).

27. But see Debra Lyn Bassett, “*I Lost at Trial—in the Court of Appeals!*”: *The Expanding Power of the Federal Appellate Courts to Reexamine Facts*, 38 HOUS. L. REV. 1129, 1154–76 (2001) (decrying increased scrutiny of jury fact finding by appellate courts).

28. While beyond the scope of this Article, the general prevalence of products involving women’s reproductive health in mass tort litigation is worth noting. See Joan E. Steinman, *Women, Medical Care, and Mass Tort Litigation*, 68 CHI.-KENT L. REV. 409, 409–14 (1992) (observing that “women seem to be disproportionately affected by harmful drugs and medical devices,” and suspecting a different standard of care by manufacturers).

29. See, e.g., Arthur Allen, *Shots in the Dark*, WASH. POST MAG., Aug. 30, 1998, at 10, 13–15, 21, available at <http://www.washingtonpost.com/wp-srv/national/longterm/sunmag/shots/shot1.htm> (discussing the changing evidence linking certain vaccines to childhood neurological disorders).

30. See, e.g., Joëlle Anne Moreno, *Beyond the Polemic Against Junk Science: Navigating the Oceans that Divide Science and Law with Justice Breyer at the Helm*, 81 B.U. L. REV. 1033, 1063 n.172 (2001); Robert L. Rabin, *Environmental Liability and the Tort System*, 24 HOUS. L. REV. 27, 33–36 (1987) (separating traditional from multiparty and toxic tort cases).

create problems for this traditional paradigm because doctors have not yet reached the level of sophistication necessary to understand the biological mechanism behind the plaintiff's condition.³¹ The best that medicine can do is rely on statistics and other proxies to determine whether a substance creates a health risk.³² Commentators and some courts have therefore advocated for a shift to risk-based harm.³³ Under a risk-based regime (presumably involving the use of class actions as well), courts do not need to inquire into specific causation. Only the statistical risks imposed by a substance are important. Once these risks are calculated, liability funds can be established and victims insured against their future risks of injury.³⁴

Uncertainty exists beyond the issue of specific causation, however. It can surround the determination of general causation; in other words, there may be uncertainty in the calculation of the risk itself.³⁵ Many toxic tort cases are brought when a mature scientific record has not yet developed: The law wants answers, but science is not ready.³⁶ Given the nature of scientific research, the prevalence of this timing problem is unsur-

31. See Berger, *supra* note 18, at 2123 (noting that for most mass tort cases "the precipitating mechanism that explains the . . . substances' effects is unknown").

32. See Michael D. Green, *Expert Witnesses and Sufficiency of Evidence in Toxic Substances Litigation: The Legacy of Agent Orange and Bendectin Litigation*, 86 NW. U. L. REV. 643, 645 (1992) (noting that given present technology "biological mechanisms of most diseases are understood marginally at best"); see also Troyen A. Brennan, *Causal Chains and Statistical Links: The Role of Scientific Uncertainty in Hazardous-Substance Litigation*, 73 CORNELL L. REV. 469, 509 (1988) (discussing the use of "statistical models and mathematical formulae" in assessing the potential carcinogenic nature of chemicals).

33. E.g., *Herskovits v. Group Health Coop. of Puget Sound*, 664 P.2d 474, 481 (Wash. 1983) (Pearson, J., concurring) (suggesting that the "injury" caused by a doctor's negligent diagnosis could be defined as the decreased chance of surviving cancer); David Rosenberg, *The Causal Connection in Mass Exposure Cases: A "Public Law" Vision of the Tort System*, 97 HARV. L. REV. 851, 859 (1984).

34. See David Rosenberg, *Individual Justice and Collectivizing Risk-Based Claims in Mass-Exposure Cases*, 71 N.Y.U. L. REV. 210, 245-48 (1996). In his article, Rosenberg calls for mandatory collectivization in the adjudication and settling of risk-based claims. See generally *id.*

35. See *Confronting the New Challenges of Scientific Evidence*, 108 HARV. L. REV. 1481, 1587-89 (1995) [hereinafter *New Challenges*] (defining this problem as a "Class II" scientific evidence problem, as opposed to a "Class I" problem, which occurs when jurors have difficulty understanding the scientific evidence).

36. See Feldman, *supra* note 12, at 45-46 (describing the problem of litigation brought before sufficient scientific data has been collected).

prising. Scientific studies, particularly epidemiological ones, are expensive and time consuming;³⁷ usually few specific studies will be available prior to litigation.³⁸ "There are thousands upon thousands of synthetic agents being used in the United States that might pose toxic risks, yet only a tiny fraction have been the subject of any epidemiologic inquiry."³⁹ Litigation may spur research, but those results will only appear in the future, often after litigation has ended.⁴⁰

This Article addresses the problems surrounding changing scientific evidence of general causation. Part I examines the costs created by the legal system's current inability to handle changing scientific evidence. Part I also suggests that the problem differs from the "usual" case in which courts get facts wrong, and therefore that the legal system ought to view it differently.

Part II observes that the changing scientific evidence problem is caused by the conflicting timelines of law and science. More specifically, the law's emphasis on speedy dispute resolution and finality clashes with science's culture of incremental study and constant reevaluation. Part II thus argues that any solution must account for this time mismatch in order to be successful.

Finally, Part III looks at possible solutions. It first notes that a number of the more creative tort reform proposals, such as those involving agencies, would eliminate the time mismatch by removing courts from the decision-making process and replacing them with more flexible institutions. These proposals, however, require fundamental changes to the structure of the tort system and thus may prove too radical to obtain public acceptance. Responding to this concern, Part III then offers more modest solutions that operate with minimal changes to the current institutional structure. For example, courts could stay proceedings for a fixed period of time when additional confirmatory studies were anticipated. Alternatively, courts could

37. Green, *supra* note 32, at 680.

38. See Feldman, *supra* note 12, at 17 (observing that, generally speaking, scientific research has barely begun at the start of litigation).

39. Green, *supra* note 32, at 680 (citing a 1982 survey determining that "[a]mong seventy-five chemicals found to be carcinogens in animals, only thirteen had been the subject of epidemiologic study").

40. See Feldman, *supra* note 12, at 17 (suggesting that general scientific acceptance of a conclusion will not occur during a lawsuit's lifetime); Nagareda, *supra* note 4, at 317.

address changing scientific evidence after final judgment through an expansion of postjudgment relief. Although both solutions have drawbacks, they may represent the best balance by which accuracy can be improved with minimal disruption to existing institutions.

I. THE PROBLEM OF CHANGING SCIENTIFIC EVIDENCE

Whenever litigation occurs before the scientific community has developed a substantial literature on the harmful effects of a substance, there is a significant probability that fact finders will reach ultimately inaccurate conclusions. But surely there are many other instances in which courts “get things wrong.” For example, a jury may believe certain witnesses and not others and determine that a defendant ran a red light and caused an accident. Later, a videotape may surface showing precisely the opposite: The plaintiff, not the defendant, was the one who ran the light. Yet, special procedures are not developed to deal with these cases. Trials are not delayed in the hope that a videotape may surface; judgments are not reopened to revise the record. The interests of swift dispute resolution and finality trump the competing value of accuracy. Indeed, according to traditional economic analysis, as long as error is unbiased—that is, on average plaintiffs and defendants benefit equally from errors—the optimal deterrence goals of the tort system are unaffected. So why concern ourselves with the problem of changing scientific evidence at all?

A. ERROR COSTS GENERALLY

Even if errors are unbiased,⁴¹ the legal system should hardly treat them so blithely. Of course the judicial system juggles various competing goals, but accuracy is arguably the paramount goal, and few things (outside the criminal law)⁴²

41. Part I.B argues that the errors revealed by changing scientific evidence are biased and indeed favor plaintiffs.

42. For example, the public has grown increasingly distressed by the scores of inmates (often death-row inmates) exonerated by newly analyzed DNA evidence. *E.g.*, Raymond Bonner, *Death Row Inmate Is Freed After DNA Test Clears Him*, N.Y. TIMES, Aug. 24, 2001, at A11; Adam Liptak, *DNA Will Let a Montana Man Put Prison Behind Him, but Questions Linger*, N.Y. TIMES, Oct. 1, 2002, at A18 (reporting the exoneration of one defendant and subsequent requests for an audit of the Montana state crime lab); Governor George H. Ryan, Commutation Announcement at Northwestern University School of Law (Jan. 11, 2003), at <http://www.law.northwestern.edu/depts/communicate/newspages/spring03/ryanspeech.htm> (issuing a blanket

undermine public confidence in the legal system like massive, industry-bankrupting lawsuits that are later proven wrong by science.⁴³ Some error is perhaps inevitable and thus understandable, but frequent error only serves to solidify public suspicions that the legal system is broken and badly in need of repair.⁴⁴

From an economic standpoint, errors clearly impair the social insurance goal of tort law, as some plaintiffs will receive (or not receive) awards based on erroneous factual determinations. Moreover, when the stakes are high, errors cause widespread social and economic harm. In the face of such high stakes, the mere fact that error is unbiased provides little comfort to companies who can potentially go bankrupt long before any future cases can balance out earlier errors. The fear of future litigation will cause some manufacturers to exit the market and deter others from entering it in the first place.

These market exits deprive consumers of useful goods and services. In the 1980s, the vaccines for measles, mumps, and rubella (MMR) and diphtheria, tetanus, and pertussis (DTP) were suspected of causing a variety of childhood neurological disorders.⁴⁵ Mounting lawsuits coupled with the unavailability of affordable liability insurance caused childhood vaccine manufacturers to exit the market.⁴⁶ By 1986, only one private

commutation for death row prisoners in Illinois); see also CTR. ON WRONGFUL CONVICTIONS, NORTHWESTERN UNIV. SCH. OF LAW, ILLINOIS DEATH PENALTY EXONERATIONS, at <http://www.law.northwestern.edu/depts/clinic/wrongful/deathpenalty.htm> (last modified May 4, 2003) (reporting that since the death penalty was restored in Illinois a quarter of a century ago, seventeen of the 298 individuals sentenced to death in Illinois have been exonerated—"a rate of 5.7%, the highest exoneration rate of the 38 states with death penalties on their books").

43. See Peter H. Schuck, *Multi-Culturalism Redux: Science, Law, and Politics*, 11 YALE L. & POLY REV. 1, 22-23 (1993) (discussing how scientific evidence that contradicted the legal results in the Bendectin litigation "contributed to a more general discrediting of the tort system" because the litigation had driven the product off the market). Perhaps even more disconcerting is the prospect that manufacturers would be erroneously immunized against future lawsuits.

44. See *id.* at 22 (suggesting that "public attitudes, political discourse, and scientific opinion can alter the level of legal error that society, and hence the law, will accept").

45. *E.g.*, Stephen Engelberg, *Vaccine: Assessing Risks and Benefits*, N.Y. TIMES, Dec. 19, 1984, at C1 (summarizing studies showing adverse effects from MMR and pertussis vaccines).

46. See STAFF OF THE SUBCOMM. ON HEALTH & THE ENV'T, COMM. ON ENERGY & COMMERCE, 99TH CONG., 2D SESS., CHILDHOOD IMMUNIZATIONS 73-74, 85-89 (Comm. Print 1986) [hereinafter CHILDHOOD IMMUNIZATIONS];

manufacturer of MMR and two of DTP remained.⁴⁷ Facing a destabilized vaccine market, a public health threat of vaccine shortages, and an accompanying risk of disease outbreaks, Congress ultimately established a federal no-fault compensation program under the National Childhood Vaccine Injury Act of 1986.⁴⁸ Ironically, the whole vaccine crisis might have been avoided. Later evidence questioned any causal link between the vaccines and brain damage.⁴⁹ In August 2001, the *New England Journal of Medicine* published the largest study ever on the adverse effects of DTP and MMR vaccinations.⁵⁰ Its conclusion: While the vaccines may elevate the risks of certain seizures, "these risks do not appear to be associated with any long-term, adverse consequences."⁵¹

The problem of changing scientific evidence can also have potentially distorting effects on the scientific process. Scientists rely on publication and peer review to verify their findings and communicate with their colleagues. Excessive zeal in transforming preliminary discussion studies into bases for litigation is likely to chill the free flow of information within the scientific community, or at least alter it to the detriment of scientific progress. As one coauthor of a (later refuted) 1981 study linking spermicides to birth defects lamented, "[i]n our present litigious environment, the reservations and qualifications written into a published report are often ignored, and the article is used

Daniel A. Cantor, *Striking a Balance Between Product Availability and Product Safety: Lessons from the Vaccine Act*, 44 AM. U. L. REV. 1853, 1858-60 (1995); see also CHILDHOOD IMMUNIZATIONS, *supra*, at 86 (reporting that vaccine manufacturers faced up to \$3.5 billion in potential liability).

47. H.R. REP. NO. 99-908, at 7 (1986), *reprinted in* 1986 U.S.C.C.A.N. 6344, 6348.

48. Pub. L. No. 99-660, 100 Stat. 3755 (1986). For a broader discussion on the operation of the federal Vaccine Injury Compensation Program, see Allen, *supra* note 29, at 13-14, 22-23.

49. See Allen, *supra* note 29, at 14 (reporting that in the mid-1990s the Department of Health and Human Services tightened compensation requirements based on its belief that "DPT is only rarely to blame for the brain damage children have suffered after getting DPT shots," but also noting that a 1994 Institute of Medicine panel concluded that some causal relation existed).

50. William E. Barlow et al., *The Risk of Seizures After Receipt of Whole-Cell Pertussis or Measles, Mumps, and Rubella Vaccine*, 345 NEW ENG. J. MED. 656, 656 (2001).

51. *Id.* at 656; see also Kreesten Meldgaard Madsen et al., *A Population-Based Study of Measles, Mumps, and Rubella Vaccination and Autism*, 347 NEW ENG. J. MED. 1477, 1477 (2002) (reporting "strong evidence against the hypothesis that MMR vaccination causes autism" in a large Danish study).

as 'proof' of a causal relationship."⁵² Consequently, he argued that initial findings should be discussed only at scientific meetings and publication delayed until "more information [is] available."⁵³

B. BIASED ERROR

The errors revealed by changing scientific evidence are of even greater concern because they are indeed biased. This bias—as it turns out, bias in favor of plaintiffs—means that the errors do not cancel out and optimal deterrence is not maintained. Instead, manufacturers are systematically overdeterrred, further exacerbating the harm to social welfare discussed above.

Traditionally, plaintiffs could bring suit only within a very limited time frame set by statutes of limitations, which ran from the "time of injury."⁵⁴ During this window, plaintiffs had to accept the scientific evidence as they found it, whether favorable or not. This regime had its obvious injustices, but the error was presumably unbiased—sometimes, plaintiffs had favorable evidence that was later proven false; other times, defendants did. The errors theoretically cancelled out in the long run.⁵⁵

Toxic torts, however, are often difficult to detect at the time of injury, and thus jurisdictions have increasingly adopted the "discovery rule" in these types of cases.⁵⁶ Under the discovery rule, the limitations period does not begin to run until the plaintiff "discovers" or reasonably should have discovered the injury, and in many states, its cause.⁵⁷ Practically speaking, the

52. Lewis B. Holmes, Letter to the Editor, *Vaginal Spermicides and Congenital Disorders: The Validity of a Study*, 256 JAMA 3096, 3096 (1986).

53. *Id.*

54. *E.g.*, *Thornton v. Roosevelt Hosp.*, 391 N.E.2d 1002, 1003 (N.Y. 1979) (sustaining a date-of-injury rule).

55. One should note, however, that there was unbiased error only with respect to *changing* scientific evidence, which assumes that at least some studies exist. The overall error was biased against plaintiffs. Since scientific knowledge starts from a state of ignorance, oftentimes no studies exist—neither for plaintiffs nor for defendants. And in the absence of evidence, defendants always prevail.

56. *E.g.*, *In re N.Y. County DES Litig.*, 678 N.E.2d 474, 476–77 (N.Y. 1997) (discussing New York statute adopting a discovery rule); *Sahlie v. Johns-Manville Sales Corp.*, 663 P.2d 473 (Wash. 1983) (en banc) (discussing common law precedent adopting a discovery rule prior to enactment of a superceding statute).

57. *See generally* 2 MARSHALL S. SHAPO, *THE LAW OF PRODUCTS*

rule makes sense; without it, plaintiffs exposed to substances initially thought to be harmless would rarely, if ever, be able to recover.⁵⁸

By expanding the window during which plaintiffs can bring suit, however, some variants of the discovery rule create an unintended effect. Permitting plaintiffs to forgo litigation until they discover the cause of their injury increases the likelihood that plaintiffs will bring litigation when (possibly changing) scientific evidence is favorable to them. If early studies fail to show any evidence of a causal link, plaintiffs will wait, because they will be presumably unaware of the cause of their injury.⁵⁹ Once a study indicates a possible linkage, however, plaintiffs can litigate immediately. In contrast, defendants, lacking the practical means to obtain declaratory judgments against unknown plaintiffs, are unable to exploit any early studies in their favor.⁶⁰

The only pressure possibly counteracting this plaintiff bias appears to be the set of incentives governing plaintiffs' attorneys. By permitting the attorneys of early entrants to monopolize enforcement,⁶¹ class actions create strong incentives for at-

LIABILITY (4th ed. 2001), ¶¶ 30.05-.06 (discussing the discovery rule); Lisa K. Mehs, *Asbestos Litigation and Statutes of Repose: The Application of the Discovery Rule in the Eighth Circuit Allows Plaintiffs to Breathe Easier*, 24 CREIGHTON L. REV. 965, 973-84 (1991) (discussing variants of the discovery rule used in asbestosis cases).

58. *Condon v. A.H. Robins Co.*, 349 N.W.2d 622, 625 (Neb. 1984) (arguing that "it would be a Hobson's choice" to suggest that a plaintiff must "show not only a breach of duty but an injury or damage resulting from that breach," while also "suggest[ing] that the time for bringing that action could begin and terminate before the individual could either reasonably be aware of the injury or damage or be able in any manner to establish its existence"); 2 SHAPO, *supra* note 57, ¶ 30.05[2][b].

59. Under what conditions plaintiffs may wait is ultimately a jury question and depends on state law, but many courts have not started limitations periods until a sizable body of evidence favorable to the plaintiff has developed. *E.g.*, *Hoerner v. Wesley-Jensen, Inc.*, 684 So. 2d 508, 514 (La. Ct. App. 1996) (holding that the limitations period did not begin until the plaintiff read a medical journal study linking extended-wear contact lenses to eye infections); *Graves v. Church & Dwight Co.*, 541 A.2d 725, 728-29 (N.J. Super. Ct. App. Div. 1988) (tolling limitations period despite the existence of studies linking baking soda to stomach ruptures because of uncertainty in the medical community), *aff'd by an equally divided court*, 558 A.2d 463 (N.J. 1989).

60. Indeed, absent ongoing litigation, early studies in favor of defendants (i.e., showing no causal link) are unlikely to be published at all since they do not represent "interesting" findings. *See infra* note 95.

61. Courts review many factors when appointing class counsel, but invariably a major factor is "the work counsel has done in identifying or investigating potential claims in the action." FED. R. CIV. P. 23(g)(1)(C)(i) (adopted by

torneys to move quickly, even if the evidence is not as favorable as desired.⁶² But even the most zealous plaintiff attorney will begin costly proceedings only if the available evidence offers a significant probability of success. This counterbalance is therefore unlikely to be sufficient to guarantee unbiased error.

C. IMPROVING EVIDENCE WITH TIME

Aside from the various concerns over errors and error costs, one can analytically distinguish evidence of general causation from the evidence in a traditional tort case, possibly justifying different treatment. This is because evidence of general causation improves with time, whereas evidence in a traditional tort case degrades.⁶³

In a traditional accident case, evidence is generated in a single incident.⁶⁴ Thereafter, that evidence degrades: Witnesses become unavailable or forgetful; physical evidence becomes lost or less reliable.⁶⁵ The only possibility of evidence improving is if new technology later provides better tools for analysis, but by definition such technology is currently unknown and the time frame entirely unpredictable. Under these instances, statutes of limitation sensibly induce parties to investigate and to litigate the issues promptly,⁶⁶ and doctrines such as *res judicata* prevent later reexaminations based on stale evidence.

In contrast, evidence about general causation typically improves over time.⁶⁷ Improvement can occur in two ways. First,

the U.S. Supreme Court and transmitted to Congress on Mar. 27, 2003, H.R. REP. NO. 108-56, at 7, to be effective Dec. 1, 2003, absent Congressional action).

62. See Peter A. Drucker, *Class Certification and Mass Torts: Are "Immature" Tort Claims Appropriate for Class Action Treatment?*, 29 SETON HALL L. REV. 213, 221 n.33 (1998) (arguing that immature class actions, by litigating claims before sufficient proof is available, disadvantage class members).

63. Charles Nesson, *Agent Orange Meets the Blue Bus: Factfinding at the Frontier of Knowledge*, 66 B.U. L. REV. 521, 533 (1986) (distinguishing cases in which the passage of time generates more evidence from cases based on past events in which little evidence remains to be discovered).

64. See, e.g., D.H. Kaye, *Proof in Law and Science*, 32 JURIMETRICS J. 313, 317 (1992) (describing events in legal proceedings as "over and done with").

65. Cf. *Order of R.R. Telegraphers v. Ry. Express Agency, Inc.*, 321 U.S. 342, 348-49 (1944) (noting that statutes of limitations are designed to prevent stale claims in which "evidence has been lost, memories have faded, and witnesses have disappeared").

66. Cf. Michael D. Green, *The Paradox of Statutes of Limitations in Toxic Substances Litigation*, 76 CAL. L. REV. 965 (1988) (discussing the problem of statutes of limitations creating premature mass tort actions).

67. One should note that toxic tort cases often involve issues of both gen-

the *data* available for studies on general causation improves over time. Whether a substance like silicone causes a harmful effect is a universally applicable question; it is not confined to a particular case.⁶⁸ Thus, if some population continues to consume a drug or to be exposed to a suspected toxin, time will generate more physical data. Even if no one is further exposed, to the extent that some diseases involve long latency periods, the data will also improve with time.

Second, even if the amount of available data (i.e., the number of people exposed to the substance) remains constant, the *studies* that collect and analyze the data improve over time. Although large epidemiological studies are generally thought to be the most reliable evidence of general causation,⁶⁹ they are unfortunately also the most expensive and time consuming because they involve collecting information from large numbers of people. Early studies thus typically use smaller sample sizes or less costly techniques and depend on later confirmatory studies to verify their results.⁷⁰

* * * *

The above analysis suggests that it is not necessary for the law to treat all errors alike. Errors regarding general causation

eral causation and specific causation. Proving specific causation often involves facts such as whether and when the plaintiff was actually exposed to a substance and at what dosage. These types of facts, however, generally degrade with time, being similar to those found in traditional accident cases. See *infra* Part III.C.3.

68. In this way, one can consider general causation to be a legislative fact in the dichotomy famously drawn by Kenneth Culp Davis. See Kenneth Culp Davis, *An Approach to Problems of Evidence in the Administrative Process*, 55 HARV. L. REV. 364, 402-10 (1942). Professor Davis's original distinction defined legislative facts as those facts that form the basis for law and policy, as opposed to those facts that concerned only the parties in a particular case. *Id.* at 402. The legislative fact designation, however, can be applied more broadly; it can be applied to all facts that are "general" in character and applicable to a large class of persons.

69. Cf. *id.* at 530 (drawing a distinction between clinical and statistical proof, and suggesting that facts such as general causation are best determined via carefully controlled scientific studies that use statistics, rather than the clinical judgment of any single practitioner); William Meadow & Cass R. Sunstein, *Statistics, Not Experts*, 51 DUKE L.J. 629, 631, 641 (2001) (proposing that the legal system should rely on statistical data, rather than expert opinions, to mitigate personal bias in judgments about risk).

70. See Michael B. Bracken, *Spermicidal Contraceptives and Poor Reproductive Outcomes: The Epidemiologic Evidence Against an Association*, 151 AM. J. OBSTETRICS & GYNECOLOGY 552, 555 (1985).

may carry significant economic and legitimacy costs, distort the scientific process, and result in overdeterrence. In addition, the usual concerns about stale or degraded evidence are far less salient in the context of general causation. Thus, while values such as speedy dispute resolution and finality remain important, they are less important with respect to general causation and may need to yield to accuracy concerns in certain situations. The remainder of the Article offers suggestions on how the legal system might minimize errors caused by changing scientific evidence.

II. TIMELINES: HOW TO VIEW THE PROBLEM OF CHANGING SCIENTIFIC EVIDENCE

Finding a solution to the problem of changing scientific evidence requires an understanding of the timelines of both legal and scientific inquiry. Law and science have fundamentally different philosophies and purposes:⁷¹ Law values speedy resolution and finality in addition to accuracy; science focuses primarily on accuracy alone. Courts and scientists therefore have different timelines for resolving disputes and controversies, and the resulting tension creates the changing scientific evidence problem.

A. LAW VERSUS SCIENCE

The timeline for legal inquiry is brief. Because of the pressing need for dispute resolution, the legal system typically lacks the patience for prolonged research or further inquiry.⁷² Although litigation inevitably experiences delays, courts do not otherwise purposefully delay decision.⁷³ With two litigants and

71. *E.g.*, *Mercado v. Ahmed*, 756 F. Supp. 1097, 1100 (N.D. Ill. 1991); Susan E. Cowell, Note, *Pretrial Mediation of Complex Scientific Cases: A Proposal to Reduce Jury and Judicial Confusion*, 75 CHI.-KENT L. REV. 981, 983-98 (2000) (discussing the tension between science and the law).

72. *E.g.*, *Wells v. Ortho Pharm. Corp.*, 788 F.2d 741, 745 (11th Cir. 1986) ("[P]roducts liability law does not preclude recovery . . . until science has had the time and resources to complete sophisticated laboratory studies of the chemical." (quoting *Ferebee v. Chevron Chem. Co.*, 736 F.2d 1529, 1536 (D.C. Cir. 1984))); *see also* SHEILA JASANOFF, *SCIENCE AT THE BAR* 9-10 (1995) (noting that because the legal system seeks closure, it cannot postpone a decision until more evidence arises).

73. *See Mercado*, 756 F. Supp. at 1100 ("Courts are not to be deterred from making a decision because the matter is beset with doubt."); Nagareda, *supra* note 4, at 316 (observing that although litigation is subject to various and considerable delays, "unlike political bodies, it generally cannot refuse to decide").

a dispute to settle, courts take the case and make the best decision out of whatever evidence is presented.⁷⁴ As Professors Hart and McNaughton once aptly noted:

The law does not require absolute assurance of the perfect correctness of particular decisions. While it is of course important that the court be right in its determinations of fact, it is important that the court decide the case when the parties ask for the decision and on the basis of the evidence presented by the parties. A decision must be made now, one way or the other. To require certainty or even near-certainty in such a context would be impracticable and undesirable. The law thus compromises.⁷⁵

Moreover, legal decisions are considered final and are not open for reexamination.⁷⁶ Doctrines such as *res judicata* give great weight to the value of finality, even in instances when defending finality sacrifices accuracy.⁷⁷ As discussed in Part III.D, *res judicata* has few exceptions, reflecting the policy that "there be an end of litigation" and that there be "private peace."⁷⁸ The rhetoric surrounding legal decision making reinforces this aura of finality by denying any uncertainty. Juries decide facts in definitive "yes or no" fashion without any expression of their level of confidence.⁷⁹ Thus, although legal decisions are made ex-

74. See Green, *supra* note 32, at 696-97 ("The luxury of reserving judgment and advocating further investigation to resolve an uncertainty is not one available to the legal system. Courts must resolve disputes and resolve them based on their best estimate of the truth, regardless of how much uncertainty infects that assessment." (citations omitted)).

75. Henry M. Hart & John T. McNaughton, *Evidence and Inference in the Law*, DAEDALUS, Fall 1958, at 40, 45.

76. See *New Challenges*, *supra* note 35, at 1484 (defining the purpose of the legal system as achieving the "authoritative, final, just, and socially acceptable resolution of disputes").

77. See *Merrell Dow Pharm., Inc. v. Oxendine*, 649 A.2d 825, 831 (D.C. 1994) (holding that the outcome of a case "must turn upon the teaching of science as understood at the time of trial as best can be discerned through the presentations of the parties," and that "[t]o reopen the trial's determination of scientific truth . . . runs squarely into the fundamental principle of certainty"); cf. *Burnet v. Coronado Oil & Gas Co.*, 285 U.S. 393, 406 (1932) (Brandeis, J., dissenting) (suggesting that stare decisis reflects a policy judgment that "in most matters it is more important that the applicable rule of law be settled than that it be settled right").

78. *Federated Dep't Stores, Inc. v. Moitie*, 452 U.S. 394, 401 (1981).

79. Cf. Charles Nesson, *The Evidence or the Event? On Judicial Proof and the Acceptability of Verdicts*, 98 HARV. L. REV. 1357, 1382-84 (1985) (explaining how "proportionate awards," awards that would be based on the probability that the defendant caused the harm, may undermine attempts to shape behavior). Analogously, judges traditionally deny any uncertainty in law, often interpreting laws under the fiction that indeterminacy never existed. See Radbruch, *Introduction to Legal Study*, in *THE LEGAL PROCESS* 1407, 1408-09 (Henry M. Hart & Albert M. Sacks eds., 1958) (excerpt from the chapter on

tremely quickly and sometimes with few assurances of reliability, they are ironically accepted as conclusive.⁸⁰

In stark contrast, science has a "relatively open-ended" time frame.⁸¹ With its focus primarily on accuracy, scientific inquiry proceeds in a progressive, incremental fashion. Controversies are resolved not through speedy formal proceedings, but through the time-consuming process of consensus building.⁸² Of course, external factors, such as a potentially grave public health crisis, can accelerate scientific investigation by providing more resources or by creating a sense of urgency.⁸³ But for the most part, the process of fact finding is slow and deliberate.⁸⁴

By the same token, finality is not a value revered or even appreciated in the scientific community. "The very nature of science incorporates a view of even generally accepted explanations of phenomena as tentative truths, not settled certainties."⁸⁵ Being descriptive and empirical,⁸⁶ the scientific method relies on testable and falsifiable hypotheses⁸⁷—nothing is ever

Judicial Organization) (quoting the French Civil Code of 1804: "A judge who refuses to enter judgment on the pretext of the silence, obscurity or inadequacy of the statute is subject to prosecution for a denial of justice."). Some recent doctrines, however, do acknowledge the possibility of ambiguities in the law. See, e.g., *Teague v. Lane*, 489 U.S. 288, 299–301 (1989) (addressing the question of retroactivity under habeas corpus review in a case applying "new law" under the Constitution); *Chevron U.S.A., Inc. v. Nat'l Res. Def. Council, Inc.*, 467 U.S. 837, 842–43 (1984) (establishing the first stage of the *Chevron* test for agency deference, which asks whether a statute is "ambiguous"); *Harlow v. Fitzgerald*, 457 U.S. 800, 818 (1982) (developing the qualified immunity doctrine under § 1983, which immunizes government officials unless their actions were in violation of "clearly established" law).

80. Schuck, *supra* note 43, at 25.

81. *Id.* at 17.

82. See generally Ernan McMullin, *Scientific Controversy and Its Termination*, in SCIENTIFIC CONTROVERSIES 49 (H. Tristram Engelhardt, Jr. & Arthur L. Caplan eds., 1987) (discussing the ways in which scientific controversies are resolved).

83. Dresser et al., *supra* note 13, at 743–45 (suggesting that litigation sparked scientific study in both Bendectin and silicone breast implants).

84. See Berger, *supra* note 18, at 2119 (noting the considerable time necessary before the scientific community even reaches a temporary consensus on causation issues); Feldman, *supra* note 12, at 17 n.79 (describing the slow progress of science in determining harmful substances in the face of latency periods and the absence of signature diseases); Sanders, *supra* note 23, at 23 (reporting that over time the research methodology in Bendectin improved and the scientific certainty of the research increased).

85. *Merrell Dow Pharm., Inc. v. Oxendine*, 649 A.2d 825, 830 (D.C. 1994).

86. See *New Challenges*, *supra* note 35, at 1484.

87. See KARL R. POPPER, *THE LOGIC OF SCIENTIFIC DISCOVERY* 40–41

final; nothing ever certain.⁸⁸ Every theory is provisional, because it can be proven false by “even a single observation that disagrees with [its] predictions.”⁸⁹

So what happens when law and its short timeline attempts to draw evidence from science and its long (and potentially indefinite) timeline? Inevitably, the legal system will on occasion make decisions based on bodies of scientific knowledge that are in their infancy.⁹⁰ And as science makes new findings and discovers new evidence, those decisions may be called into question. In short, the legal system ends up with the problem of changing scientific evidence.

The natural solution is to match the timelines of law and science. Unfortunately, the purposes and traditions of courts are so different from those of scientists that complete timeline congruence is essentially impossible. Litigation cannot drag on indefinitely waiting for the possibility of scientific progress.⁹¹ At the same time, science cannot artificially cease its processes of reexamination.⁹² The unavailability of perfect congruence, how-

(1959) (discussing the now-famous “falsifiability” characteristic of scientific investigation); see also Stephen Jay Gould, *Adam’s Navel*, in *EYEWITNESS TO SCIENCE* 95, 95–105 (John Carey ed., 1995) (discussing the importance of falsifiability in science).

88. See *Daubert v. Merrell Dow Pharm., Inc.*, 509 U.S. 579, 589–90 (1993) (observing that “arguably, there are no certainties in science”); Feldman, *supra* note 12, at 16 (characterizing the dynamic view of science as the “central lesson of the switch from logical to revised empiricism” and acknowledging that revision is always an option because new data changes collective judgments and replaces previously held theories).

89. STEPHEN HAWKING, *THE ILLUSTRATED A BRIEF HISTORY OF TIME* 15–17 (1996); see also Editorial, *In Science We Trust*, *SCI. AM.*, Dec. 2002, at 14 (“The greatest mistake is to wait for 100 percent scientific certainty or agreement, because it will never materialize.”). As David Hume noted, because what one sees as “cause-and-effect” is determined only by a series of observations, one never knows whether that previous pattern of observations was purely coincidental (and hence the attribution of “causal” was entirely false). DAVID HUME, *AN ENQUIRY CONCERNING HUMAN UNDERSTANDING* 109–18 (Oxford Univ. Press 1999) (1748).

90. See *Daubert*, 509 U.S. at 596–97 (“[T]here are important differences between the quest for truth in the courtroom and the quest for truth in the laboratory. Scientific conclusions are subject to perpetual revision. Law, on the other hand, must resolve disputes finally and quickly.”).

91. See *People v. McDonald*, 690 P.2d 709, 721 n.15 (Cal. 1984) (“[A]ppellate judges do not have the luxury of waiting until their colleagues in the sciences unanimously agree that on a particular issue no more research is necessary. Given the nature of the scientific endeavor, that day may never come.”).

92. See, e.g., McMullin, *supra* note 82, at 80–81 (discussing the failure of agronomist T.D. Lysenko under the Soviet regime to overthrow “Morganist”

ever, clearly does not preclude striving for better congruence.

B. SCIENTIFIC MATURITY

Given the legal system's inability to wait forever and litigation's need for a finite time frame, is there some time frame that is better than the others? As it turns out, a reasonable compromise between the legal and scientific timelines can be achieved by focusing on the maturity of scientific evidence. From a scientific perspective, the idea of "maturity" may seem a contradiction in terms since science never truly views anything as certain or final. But from a practical or legal perspective, scientific maturity can prove extremely useful by suggesting how the legal system might better accommodate the scientific process.

Anyone rethinking the timeline for legal inquiry must balance error costs and waiting costs.⁹³ Error costs are the costs of inaccurate decisions; waiting costs are the costs attributable to unresolved disputes, uncompensated plaintiffs, and financially unstable defendants. In a traditional tort case, since evidence degrades with time,⁹⁴ delay creates both error costs and waiting costs. Courts therefore understandably concentrate on shortening the timeline. In proceedings involving general causation, however, delay creates waiting costs, but the delay also reduces error costs. The legal system, however, cannot delay forever, and so the question becomes: When does delay yield diminishing returns? The answer lies in the idea of scientific maturity.

Given limited research funds, scientists are reluctant to squander their time and resources on studies that merely verify conventional wisdom and/or the harmlessness of a substance.⁹⁵ Consequently, early studies often sacrifice reliability for af-

genetics and to impose a brand of Lamarckian evolution by decree).

93. Science, of course, has few waiting costs, and thus has the luxury of focusing exclusively on minimizing error. See KENNETH R. FOSTER & PETER W. HUBER, *JUDGING SCIENCE: SCIENTIFIC KNOWLEDGE AND THE FEDERAL COURTS* 17 (1999).

94. See *supra* Part I.C.

95. See GREEN, *supra* note 17, at 315 (observing that "researchers do not explore, agencies do not fund grants, and journals do not publish studies about agents that result in negative findings"); Bracken, *supra* note 70, at 555 ("Investigators are more likely to write up positive findings, reviewers to consider them of interest, editors to publish them, and the press to publicize them."). Professor Green further notes that Bendectin is rather unusual because of the rich literature showing an absence of harmful effects. GREEN, *supra* note 17, at 315.

fordability by using smaller sample sizes or less costly techniques.⁹⁶ These preliminary studies point to promising avenues of research that are then more thoroughly researched using larger, more expensive avenues.

Research into toxic substances, therefore, experiences somewhat of a life cycle. Early on, there is a period of rapid progression in which the scientific community moves from near total ignorance to being reasonably well informed. Sometimes the period may end with a dominant, generally accepted "answer"; sometimes it may not—for example, in many scientific debates there are still two opposing camps.⁹⁷ Suffice it to say, however, at the end of this period, science has developed a stable and mature body of knowledge that is suitable for reasoned decision making.⁹⁸ Of course, whatever equilibrium is reached at the end of the life cycle may be disturbed in the future because science is a process of continual reexamination.⁹⁹ For example, new technology or a new scientific theory may alter the perspective science has on an issue. Such developments are entirely unpredictable, however.¹⁰⁰ In contrast, the life cycle likely is predictable.

Accordingly, if the legal system could account for the scientific life cycle, it could significantly ameliorate the problem of changing scientific evidence while keeping waiting costs manageable. Delaying judgment in anticipation of a definite improvement in evidence seems prudent; delaying in anticipation

96. See Bracken, *supra* note 95, at 555 (observing that "initial reports . . . are . . . often based on secondary analyses of existing data, and specifically designed studies come later").

97. See Feldman, *supra* note 12, at 17 (suggesting that general scientific acceptance of a conclusion will not occur during a litigation's lifetime).

98. Of course, maturity does not mean that science has finished or has arrived at some objective truth. One can nonetheless still have some confidence that, regardless of the distortions caused by social forces, the scientific method fundamentally generates useful information. See Joseph Sanders et al., *Legal Perceptions of Science and Expert Knowledge*, 8 PSYCHOL. PUB. POL'Y & L. 139, 147–51 (2002) (describing a "realist-constructivist view of science" in that "science is socially constructed both in the laboratory and in the wider community, but the construction is constrained by input from the empirical world").

99. Cf. Stuart Minor Benjamin, *Stepping into the Same River Twice: Rapidly Changing Facts and the Appellate Process*, 78 TEX. L. REV. 269 (1999) (discussing, in the context of changing facts and appellate review, the possibility that facts will never settle down).

100. Cf. *supra* Part I.C (discussing that evidence may improve if technology provides better tools for analysis, but those developments are unknown and unpredictable).

of unknown improvements does not.

III. SOLUTIONS

How can the legal system better account for the scientific life cycle and thereby mitigate the problem of changing scientific evidence? This Part runs through a variety of solutions, from radical tort reform to imposing more stringent evidentiary requirements. In the end, however, it settles on two proposals to help the timeline of law more closely match the timeline of science. The first would create a limited delay mechanism before trial to provide scientists with additional time to investigate the issues. The second would create a limited contingency period after final judgment during which courts could reexamine verdicts.

A. RADICAL TORT REFORM

A number of scholars have argued that the current tort system is broken beyond repair, and have therefore proposed radical tort reforms. For example, many have suggested that agencies, not courts, should handle toxic torts.¹⁰¹ This approach is motivated by a view that risks are more appropriately addressed through public regulation and administration, rather than private litigation.¹⁰²

An outright transfer to administrative agencies would readily eliminate any short-term problem of changing scientific evidence. Lacking the financial incentives of plaintiffs, agencies

101. See, e.g., W. KIP VISCUSI, REFORMING PRODUCTS LIABILITY 171-72 (1991) (suggesting an administrative alternative to the current system); Brennan, *supra* note 32, at 523-32 (developing a comprehensive agency approach to mass tort litigation with scientific, enforcement, and compensation panels); Nagareda, *supra* note 4, at 340, 349 (arguing that risks should be dealt with administratively, not through the tort system, and that administrative law and mass torts scholars need to establish a dialogue). But see CHARLES FRIED & DAVID ROSENBERG, MAKING TORT LAW: WHAT SHOULD BE DONE AND WHO SHOULD DO IT 79 (2003) (suggesting that the tort system and the administrative agencies need to work together "to achieve optimal precautions").

102. Various aspects of mass tort litigation, such as administering a settlement or recovery fund, or determining subcategories for compensation, are familiar agency responsibilities. See Kenneth S. Abraham, *Individual Action and Collective Responsibility: The Dilemma of Mass Tort Reform*, 73 VA. L. REV. 845, 885-86 (1987) (discussing the use of settlement funds and their similarity to administrative proceedings); Nagareda, *supra* note 4, at 314-15 (same). See generally Richard A. Nagareda, *Turning from Tort to Administration*, 94 MICH. L. REV. 899 (1996) (describing the similarities between the recent rise of class settlements and the historic rise of administrative agencies).

would be unlikely to pursue enforcement actions in the absence of a mature body of scientific evidence. Agencies would not even have to worry about defendant insolvency, since they could conceivably require the maintenance of insurance funds to protect against unknown future harms.

The use of agencies would have further incidental benefits. During the period of scientific immaturity, agencies could fund scientific studies independently, lessening any reliance on the parties or independent scientific interest. Once a mature body of science became available, agencies would have a significant comparative advantage over courts in assessing the evidence, as they presumably have far greater expertise in their respective fields.¹⁰³

Despite inherent advantages in flexibility and expertise, agency solutions suffer several drawbacks, including the well-known problem of agency capture.¹⁰⁴ The same discretion that empowers agencies to determine when to initiate enforcement actions also enables agencies to choose not to initiate enforcement actions at all. It is exceedingly difficult for victims to compel an agency to initiate enforcement.¹⁰⁵ Thus, if an agency becomes captured by an industry, victims may have few alternative options for recourse. Whatever its shortcomings, the tort system often serves as a check on agency capture,¹⁰⁶ and thus reforms to the system require cautious allocations of power to agencies.

103. The idea of using agencies to resolve ex post tort disputes might lead to questioning why agencies like the FDA do not simply require more stringent testing before granting approval. Practically speaking, however, clinical trials must be of a limited size and consequently have limited statistical power. Greater sample sizes and statistically powerful studies are available only after products become widely available.

104. See generally David B. Spence & Frank Cross, *A Public Choice Case for the Administrative State*, 89 GEO. L.J. 97, 105 n.37 (2000) (summarizing two types of capture theory, one created when actual "subgovernments" form, and the other created when the general public "loses interest in agency policymaking, leaving only regulated interest groups to participate in the process"). For sources on agency capture, see *id.*

105. See, e.g., *Heckler v. Chaney*, 470 U.S. 821, 837-38 (1985) (recognizing that an agency's discretion to initiate or not to initiate an enforcement action is generally nonreviewable).

106. See FRIED & ROSENBERG, *supra* note 101, at 80-81 (suggesting that "tort suits sound[] warnings that alert[] and activate[] legislatures and agencies to take needed regulatory action"). Agencies are not only subject to capture by special interest, but also subject to political pressures. See Nagareda, *supra* note 4, at 365 (expressing the concern for agency bias created by electoral concerns).

Even if agencies are not “captured,” they may still have suboptimal incentives. Agencies have limited resources and cannot research and pursue enforcement against every manufacturer and every hazardous product. Additionally, without financial motive, agencies have fewer incentives than private parties to research and litigate cases.¹⁰⁷ Furthermore, the expertise of agencies may lie more in their ability to make policy-oriented cost-benefit analyses than in their ability to make strictly scientific determinations about causation. For example, in withdrawing approval of a suspect drug, the FDA can consider whether effective alternatives exist on the market.¹⁰⁸ This type of inquiry is quite different from the causation determinations made in torts.¹⁰⁹

Finally, the most serious concern regarding radical reform proposals such as agency administration is that they are *radical*. Wholesale restructurings of the tort system involve substantial risks and disruptions to traditional practices. Replacement of the tort system with an agency-based system will remove the role of the private litigant and possibly the jury from the tort system,¹¹⁰ and will also likely involve expansions in bureaucracy. Even the most open-minded of reformists may balk at such fundamental changes. Thus, even if radical reform may be near optimal from a theoretical standpoint, it may not be feasible from a practical standpoint.

107. On one hand, this situation may be socially beneficial because agencies will conduct research or enforce claims only after weighing the costs and benefits. On the other hand, agencies may be systematically underfunded by unsympathetic legislatures.

108. See, e.g., Denise Grady, *FDA Withdraws Drug for Diabetics, Citing Health Risks*, N.Y. TIMES, Mar. 22, 2000, at A1 (reporting that the FDA kept Rezulin, a drug for diabetics, on the market despite certain health risks until safer substitutes became available).

109. See Margaret A. Berger, *The Supreme Court's Trilogy on the Admissibility of Expert Testimony*, in REFERENCE MANUAL ON SCIENTIFIC EVIDENCE 9, 32–33 (2d ed. 2000) (discussing how risk assessment, often based on cost-benefit analyses, is a different inquiry than causation). One can certainly imagine a tort system that focused more on costs and benefits than causation, but that would be a dramatic reform itself. See, e.g., Nagareda, *supra* note 4, at 342 & n.239 (arguing that when risk levels are entirely unknown, political institutions need to evaluate the risk and its associated level of uncertainty against the potential benefits of the activity); Schuck, *supra* note 43, at 12 (suggesting that when neither scientists nor lawyers can provide answers, politicians can fill the void).

110. See Schuck, *supra* note 43, at 42 (“Attempts to transform the trier-of-fact are likely to be political non-starters. This is especially true of efforts to alter the jury, one of our legal system’s sacred cows, in the name of expertise, one of our political system’s *bete-noirs*.”).

Having made this concession to the grander reforms, this Article now turns to smaller reforms that might achieve similar improvements but will involve much lower degrees of disruption and public anxiety.

B. DISMISSAL

One crude method to ensure scientific maturity before litigation is to exclude early scientific studies as unreliable and consequently dismiss claims based on immature evidence. Initially, this mechanism may disadvantage some individual plaintiffs since their claims will be dismissed and forever barred. One would expect, however, that plaintiffs' attorneys would rapidly learn the level of maturity required by courts (e.g., the number of studies, sample sizes, etc.) and would adapt accordingly to avoid future dismissals.

Recent developments in scientific evidence doctrine can be interpreted to fall along these lines. Although controversial, some courts have used a bright-line test requiring plaintiffs to provide epidemiological evidence of general causation to escape summary judgment.¹¹¹ These courts typically implement the epidemiology requirement as a corollary to the reliability requirements established in *Daubert v. Merrell Dow Pharmaceuticals, Inc.*¹¹² Toxicology is viewed with suspicion because it involves extrapolating from animals or isolated tissues to human beings.¹¹³ If a plaintiff presents only toxicological evidence,

111. See, e.g., *Porter v. Whitehall Labs., Inc.*, 9 F.3d 607, 612, 614-16 (7th Cir. 1993) (renal failure and ibuprofen); *Brock v. Merrell Dow Pharm., Inc.*, 874 F.2d 307, 313 (5th Cir. 1989), *modified*, 884 F.2d 166, 167 (5th Cir. 1989) (Bendectin). In contrast, other courts have not required epidemiological evidence. See, e.g., *Wells v. Ortho Pharm. Corp.*, 788 F.2d 741, 745 (11th Cir. 1986); *Ferebee v. Chevron Chem. Co.*, 736 F.2d 1529, 1535 (D.C. Cir. 1984). Other courts have permitted the use of toxicological evidence when epidemiological evidence was unavailable. See, e.g., *Benedi v. McNeil-P.P.C. Inc.*, 66 F.3d 1378, 1384-85 (4th Cir. 1995); *Bloomquist v. Wapello County*, 500 N.W.2d 1, 5 (Iowa 1993) (suggesting that to require epidemiological studies would "automatically deny recovery to all claimants who are injured by a toxic substance that is relatively new and as to which a statistical track record has not yet been fully established"). See generally 4 DAVID L. FAIGMAN ET AL., *MODERN SCIENTIFIC EVIDENCE: THE LAW AND SCIENCE OF EXPERT TESTIMONY* 134-38 (2002) (discussing the absence of epidemiological data in the aforementioned cases, among others).

112. See FED. R. EVID. 702; *Daubert v. Merrell Dow Pharm., Inc.*, 509 U.S. 579, 593-96 (1993).

113. See Bernard D. Goldstein & Mary Sue Henifin, *Reference Guide on Toxicology*, in *REFERENCE MANUAL ON SCIENTIFIC EVIDENCE* 401, 413-15 (2d ed. 2000). Interestingly, "[a]ll known human carcinogens cause cancer in an

which is then excluded, the claim can be dismissed for insufficiency of evidence.

If epidemiological studies take more time and occur later in the scientific life cycle, the effect of the epidemiology requirement is to delay litigation until the scientific literature is more mature. This requirement has some hefty problems, however, the most significant of which involves research incentives. To the extent that plaintiffs lack resources (or plaintiffs' attorneys lack financial incentives)¹¹⁴ to conduct or fund large-scale epidemiological studies, the effective delay period may become indefinite.¹¹⁵ After all, if plaintiffs cannot recover without epidemiological studies, why would defendant manufacturers ever conduct or fund them? At best, such studies would affirmatively exonerate the defendant—a result unnecessary for litigation success. At worst, manufacturers would be aiding in their own demise.

Furthermore, from an epistemological standpoint, why should courts completely exclude toxicological evidence?¹¹⁶ Toxicology has well-accepted methods that are commonly used by researchers and relied upon by medical professionals.¹¹⁷ The studies are certainly probative in determining general causation, and their exclusion may have distorting effects. This is especially true because toxicology can sometimes remedy statistical weaknesses faced by epidemiological studies,¹¹⁸ or predict

experimental animal, and no known animal carcinogen is known to be noncarcinogenic in humans." Ellen K. Silbergeld, *The Role of Toxicology in Causation: A Scientific Perspective*, 1 CTS. HEALTH SCI. & L. 374, 376 (1991). But see Goldstein & Henifin, *supra*, at 414 (suggesting that arsenic is carcinogenic in humans but not in animals, and that the epidemiological data for over 100 known animal carcinogens is inconclusive in humans).

114. Naturally, victims often lack financial resources to conduct large-scale scientific studies. However, to the extent that they can aggregate individual claims and exploit the resulting economies of scale, plaintiffs' attorneys have significant incentives to sponsor research, though those incentives are only a fraction (i.e., the contingency fee percentage) of defendant incentives. FRIED & ROSENBERG, *supra* note 101, at 88–92 (advocating for monopoly control over mass tort litigation to create proper research incentives).

115. See Berger, *supra* note 18, at 2135–40, 2137 n.93 (discussing manufacturers' lack of short-term incentives to conduct research while allowing later company management to take the blame).

116. See Silbergeld, *supra* note 113, at 378–79 (criticizing courts for excluding toxicology wholesale).

117. See *id.* at 375–78. See generally Goldstein & Henifin, *supra* note 113, at 403–15 (discussing the principles of toxicology, the techniques used, and its various applications).

118. See Michael D. Green et al., *Reference Guide on Epidemiology*, in

small risks that would otherwise be invisible.¹¹⁹ The debate over the relative merits of toxicology and epidemiology is a complex one beyond the scope of the inquiry here, but suffice it to say, excluding toxicology in the hope of encouraging litigation based on mature scientific evidence may be too high a cost to pay.

Dismissal and the epidemiology requirement thus provide a rather blunt instrument for adjusting the legal timeline and solving the changing scientific evidence problem. After all, the primary stated motivation behind the epidemiology requirement focuses on the reliability of particular types of scientific methodologies, not timing. The delay is merely an incidental benefit. The next subsection therefore attempts a more direct approach.

C. DELAY

If delay is what ensures scientific maturity, then why not impose delay directly? In the face of a few spotty studies, courts could stay proceedings until the body of scientific evidence became more substantial and stable.

1. Operational Details

How might such a stay mechanism be implemented? A possible scenario might fall along these lines: Legal proceedings would follow the traditional path, including the filing of pleadings and discovery. Then, either party could move for a stay for scientific maturity. The court would review the scientific evidence proffered, and if it was deemed immature, would grant a stay for a fixed period of time. The range of permissible delay periods could be set by statute or procedural rule. Upon the expiration of the delay period, the proceedings would continue as before, except that the previously "immature" scientific evidence would now be admissible.

A few features of the stay mechanism deserve further comment. First, the stay period is fixed in order to stimulate scientific research. If the stay period were dependent on the future state of scientific evidence, it would once again run the risk of becoming indefinite. The scenario would be extremely

REFERENCE MANUAL ON SCIENTIFIC EVIDENCE 333, 345-47 (2d ed. 2000) (suggesting that toxicological methods can minimize the confounder problem often encountered in epidemiological studies).

119. See Goldstein & Henifin, *supra* note 113, at 409 (discussing that toxicology's extrapolation from high doses to low doses improves statistical power).

similar to the one under the dismissal mechanism: The defendant would stay the proceedings, citing a lack of scientific maturity; little research would be conducted because plaintiffs lacked resources and defendants lacked incentives (indeed, had perverse incentives); and the science would remain immature. With a fixed, nonextendable stay period, the party moving for the stay would have every incentive to act quickly. Procrastination would only yield future adverse judgments. Independent research efforts in the scientific community, should they exist, would also likely be spurred into action given the impending deadline that would imbue any results with immediate, real-world consequences.

Second, the applicable statute or procedural rule could set the range of permissible delay lengths using empirical studies of the scientific life cycle. As previously discussed, the problem of changing scientific evidence results from a mismatch between the legal and scientific timelines.¹²⁰ While exceptional circumstances may require a more individualized analysis, for the most part, the time needed to perform high-quality, large-sample studies on a substance should fall within a commonly observed range. The length therefore need not be entirely at the court's discretion, and rule makers should definitely take advantage of the knowledge developed in the empirical studies.

Third, the stay mechanism would occur *after* the initial pleadings and discovery. The most obvious benefit of this timing is to ensure that courts will have sufficient information to determine if the stay for scientific maturity is necessary. In addition, placing the case on the docket, albeit an inactive one, has two advantages over the dismissal mechanism discussed above. First, it saves plaintiffs from the no-win situation of choosing between immediate dismissal now for lack of mature evidence and future dismissal later because the statute of limitations has run. Stays toll the statute of limitations and *wait* rather than dismiss on account of immature evidence. Second, unlike dismissals, which can be interpreted as defense victories and create defendant indifference, stays maintain litigation pressure and encourage more research.¹²¹

120. See *supra* Part II.

121. Concededly, the availability of stays will reduce the defendants' incentive to perform *ex ante* research, since they no longer have to fear being unprepared when the first suit arises. See Dresser et al., *supra* note 13, at 732-34 (criticizing the lack of testing by manufacturers to ensure long-term product safety). It may be impractical, however, to believe that defendants are able

2. Institutional Resistance

An immediate criticism of this delay proposal may be that it also is too radical. Certainly delay is not as fundamental a change as restructuring the tort system, but it runs afoul of legal traditions preferring expeditious dispute resolution.¹²²

Purposeful delay in the law, however, is not as foreign as one might initially suspect. For example, in recent years, many states have developed "inactive dockets" to handle the flood of asbestos litigation.¹²³ Due to statute of limitations concerns, large numbers of asbestos plaintiffs have been filing claims despite the absence of any current physical harm.¹²⁴ Inactive docket programs hold these "unimpaired" cases in abeyance, freeing courts to give priority to hearing claims from plaintiffs already stricken with cancer and other asbestos-related diseases.¹²⁵

Precedent for stays in proceedings also exists elsewhere in the law. In *Watts, Watts & Co. v. Unione Austriaca di Navigazione*,¹²⁶ the Supreme Court suggested the possibility of a stay due to the then-current hostilities between the United States and Austria-Hungary.¹²⁷ Moreover, under the abstention doctrine developed in *Railroad Commission v. Pullman Co.*,¹²⁸ federal courts stay proceedings to allow state courts to resolve issues of state law that may obviate the need to address constitutional questions.¹²⁹

The idea of waiting for maturity is not particularly unusual either. Although still controversial, some courts and commentators have advocated for "maturity"—here, the extent to which a

to anticipate and research unfiled claims, so any reduction in incentives may be negligible.

122. See *supra* Part II.A.

123. See generally Mark A. Behrens & Monica G. Parham, *Stewardship for the Sick: Preserving Assets for Asbestos Victims Through Inactive Docket Programs*, 33 TEX. TECH L. REV. 1 (2001) (providing an overview of inactive docket programs).

124. *Id.* at 5.

125. See *id.* at 6–7. In addition, to the extent that most asbestos-producing companies have already declared bankruptcy and possess limited resources, the inactive docket programs also channel resources to ill plaintiffs, rather than those who are merely at risk of developing illness. See *id.*

126. 248 U.S. 9 (1918).

127. See *id.* at 22–23 (creating, effectively, a stay in the proceedings until the restoration of peace between the United States and Austria-Hungary).

128. *R.R. Comm'n v. Pullman Co.*, 312 U.S. 496, 501 (1941).

129. See *id.*

particular claim has been repeatedly litigated—as a factor in class action certification.¹³⁰ Indeed, the *Manual for Complex Litigation (Third)* implies that maturity is a proper consideration for certification,¹³¹ and the Advisory Committee to the Federal Rules of Civil Procedure has proposed a subsection that would make this explicit.¹³² Use of the maturity factor has primarily been motivated by worries over the possibility of massive, one-time errors¹³³ and the attendant blackmail effects.¹³⁴ But in many ways, the concern about maturity also reflects a tacit concession not only that trial processes and decisions improve with each successive trial, but also that scientific evidence may become more stable with time.

Finally, while any reform is likely to result in some interest group opposition, one can surmise that a delay proposal may be more acceptable than most reforms. The delay mechanism would lower the standard of admissibility, which would help plaintiffs, but would also create additional time for research, which would generally help defendants. Consequently,

130. *Compare* *Castano v. Am. Tobacco Co.*, 84 F.3d 734, 747–48 (5th Cir. 1996) (expressing doubts about a class action's predominance or superiority due to the lack of a "past track record"), *with* *Eisen v. Carlisle & Jacquelin*, 417 U.S. 156, 177 (1974) (holding that class certification should not involve a preliminary or abbreviated merits inquiry). *See generally* Drucker, *supra* note 62, at 216 n.10 (discussing the controversy and citing various cases analyzing it).

131. *MANUAL FOR COMPLEX LITIGATION (THIRD)* § 33.26, at 360–61 (1997) ("Fairness may demand that mass torts with few prior verdicts or judgments be litigated first in smaller units . . . until general causation, typical injuries, and levels of damages become established.").

132. *See* Nagareda, *supra* note 4, at 309–10 (reporting a proposed subsection to "Rule 23 that would direct judges to consider 'the extent, nature, and maturity of any related litigation involving class members' as part of the class certification determination" (citations omitted)). The Advisory Committee particularly mentioned the problem of "highly uncertain facts that may come to be better understood over time" as one of the motivations behind the rule change. *Id.* The Committee, however, has placed the proposal on hold indefinitely as of 1998. *See also* Drucker, *supra* note 62, at 215 (similarly advocating the need for this maturity factor).

133. For this reason, some commentators have suggested using multiple trials and sampling to diversify the error risks in class actions. *See* Michael J. Saks & Peter David Blanck, *Justice Improved: The Unrecognized Benefits of Aggregation and Sampling in the Trial of Mass Torts*, 44 *STAN. L. REV.* 815 (1992). Sampling, of course, could not diversify the error risks of changing scientific evidence because the sampling trials would occur over too brief a time.

134. *See, e.g., In re Rhone-Poulenc Rorer Inc.*, 51 F.3d 1293, 1298 (7th Cir. 1995) (discussing the "blackmail settlements" induced by class actions). *See generally* HENRY J. FRIENDLY, *FEDERAL JURISDICTION: A GENERAL VIEW* 120 (1973) (discussing "blackmail settlements" generally).

each side has something to be happy about.

3. Other Problems

As foreseen in Part II.B, all delays impose waiting costs, and the delay mechanism discussed here is no different.¹³⁵ Plaintiffs are usually of limited means, and as potential victims of a toxic tort, they are often in need of expensive medical treatment. Imposition of a delay period therefore denies plaintiffs necessary funds during a critical time. Worse yet, during the delay period plaintiffs may die or defendants may become insolvent, making the maxim "[j]ustice delayed is justice denied" particularly ring true.¹³⁶

Another problem with delay is that it allows specific causation evidence to degrade. As discussed in Part I.C, evidence of specific causation—for example, how long and at what dosage the plaintiff was exposed to the substance—degrades over time.¹³⁷ During a four- or five-year delay, it would not be unusual for witnesses to move away, die, or otherwise become unavailable. Certainly, pretrial depositions and interrogatories taken before the stay will mitigate this unavailability issue, but fact finders will nonetheless be denied the benefits of assessing live witnesses.

4. Alternatives

Changing the timing of the stay mechanism can significantly reduce the above problems. For example, litigation could be allowed to proceed through trial and jury deliberation, and then the judge could postpone the entry of judgment for a fixed period of time. Motions in opposition to the entry of judgment or for judgment as a matter of law¹³⁸ could be accepted (or denied) as the end of the postponement period neared.¹³⁹ Allowing the proceedings to continue through trial would remove the

135. See *supra* notes 93–100 and accompanying text.

136. See *Merrell Dow Pharm., Inc. v. Oxendine*, 649 A.2d 825, 833 (D.C. 1994) (Schwelb, J., concurring) (stressing the practical injustice of having plaintiffs experience long delays in recovering damages); see also FED. R. EVID. 102 (declaring one of the purposes of the Federal Rules of Evidence as "elimination of unjustifiable expense and delay").

137. See *supra* notes 63–69 and accompanying text.

138. Like any other posttrial mechanism, implementation of a postjury postponement must grapple with the additional issue of burdens of proof. See *infra* Part III.D.3.

139. My thanks to Bob Bohrer for suggesting this procedural alternative.

problem of degrading specific causation evidence. It would also probably provide enough information for injunctions requiring defendants to maintain sufficient funds to cover possible judgments.¹⁴⁰

Of course, the later the stay mechanism appears in the process, the more litigation resources are potentially wasted. In a post-jury-deliberation stay, new scientific studies may require many trial stages to be redone, whereas in a pretrial stay, there would be fewer such inefficiencies. Appropriate placement of the stay mechanism thus should depend on a cost-benefit analysis. Factors in such an analysis would include the empirical frequency of "science reversals,"¹⁴¹ since the greater the likelihood of relitigation, the more appropriate early stay mechanisms are to minimize duplicate proceedings. Another consideration would naturally be the expected costs of each trial stage. For example, the costs of the actual trial might be insignificant compared to the costs of discovery. If this is the case, the benefits of placing the stay mechanism after trial may justify its relatively minor costs.¹⁴²

D. RES JUDICATA AND POSTJUDGMENT RELIEF

Rather than addressing immature scientific evidence with delays during litigation, courts could proceed directly to final judgment but then offer some form of postjudgment relief if the underlying science changes. For example, if sufficient scientific studies arose during a predefined contingency period after final judgment, courts could reopen litigation. Here, the length of this contingency period would be linked to the scientific life cycle.

140. The dynamics of the business environment and the poor institutional ability of judges to police corporate decision making may, however, make these injunctions impossible or ill advised in practice.

141. This empirical question may, however, be extremely difficult to answer. *See infra* Part IV.

142. On the other hand, a more cynical view would suggest that if discovery costs are prohibitive, defendants would be blackmailed into settlement long before the stay mechanism could take effect. *See* Krista R. Stine, *Silicone, Science and Settlements: Breast Implants and a Search for Truth*, 63 DEF. COUNS. J. 491, 497 (1996) (suggesting that delaying does not help manufacturers because it is "doubtful that any amount of evidence will ever convince some [breast] implant recipients that silicone implants are not responsible for their illnesses" and that even with "science and juries on their side, the litigation costs will [be] monstrous").

1. Res Judicata and Rule 60(b)

The immediate and pressing concern when discussing any form of postjudgment relief is finality. As previously mentioned, res judicata has often been celebrated as a legal cornerstone,¹⁴³ rendering as the Supreme Court once suggested, "white that which is black, and straight that which is crooked."¹⁴⁴ The policies of the rule are well known: facilitating private peace,¹⁴⁵ ensuring certainty in private and commercial activities,¹⁴⁶ and conserving scarce judicial resources by preventing duplicative, vexatious litigation.¹⁴⁷ Any attempt to relax the strictures of res judicata and leave judgments contingent, whether to account for changing scientific evidence or any other reason, might therefore seem once again like a radical departure.

Fortunately, like delay, postjudgment relief is also not as alien as it might initially appear. The seeds of flexibility have already been planted under Rule 60(b) of the Federal Rules of Civil Procedure.¹⁴⁸ The exceptions to res judicata in Rule 60(b)

143. See, e.g., *Reed v. Allen*, 286 U.S. 191, 198–99 (1932) ("[T]he interest of the state requires that there be an end to litigation."); 18 JAMES WM. MOORE ET AL., *MOORE'S FEDERAL PRACTICE* § 131.12, at 131-20 to -21 (3d ed. 1997) (discussing the interests in finality and describing claim preclusion as a "Pillar of Modern Judicial Philosophy").

144. *Jeter v. Hewitt*, 63 U.S. 352, 364 (1859); see also MOORE ET AL., *supra* note 143, § 131.12, at 131-21 to -22 (reporting that the doctrine of res judicata generally does not care if the judgment was right or wrong or whether the discovery of additional facts would create a different outcome).

145. *Federated Dep't Stores, Inc. v. Moitie*, 452 U.S. 394, 401 (1981) ("Public policy dictates that there be an end of litigation" (quoting *Baldwin v. Traveling Men's Ass'n.*, 283 U.S. 522, 525 (1931))). "[The] doctrine of res judicata . . . is a rule of fundamental and substantive justice, of public policy and private peace" *Id.* (quoting *Hart Steel Co. v. R.R. Supply Co.*, 244 U.S. 294, 299 (1917)).

146. *Comm'r v. Sunnen*, 333 U.S. 591, 597 (1948) (describing the "public policy favoring the establishment of certainty in legal relations").

147. *Id.* (noting "considerations of economy of judicial time"); 18 CHARLES ALAN WRIGHT ET AL., *FEDERAL PRACTICE AND PROCEDURE* § 4403 (2d ed. 2002) (discussing the "need to ration access to a scarce public resource").

148. Rule 60(b) reads in part:

On motion and upon such terms as are just, the court may relieve a party or a party's legal representative from a final judgment, order, or proceeding for the following reasons: (1) mistake, inadvertence, surprise, or excusable neglect; (2) newly discovered evidence which by due diligence could not have been discovered in time to move for a new trial under Rule 59(b); (3) fraud (whether heretofore denominated intrinsic or extrinsic), misrepresentation, or other misconduct of an adverse party; (4) the judgment is void; (5) the judgment has been satisfied, released, or discharged, or a prior judgment upon

are extremely narrow as currently understood,¹⁴⁹ but effective handling of changing scientific evidence would only require an extension of *res judicata*'s provisions and policies, not a sea change in legal practice.¹⁵⁰

Rule 60(b) has three subsections that are relevant to changing scientific evidence. The most significant subsection is 60(b)(2), which allows relief from judgment for "newly discovered evidence which by due diligence could not have been discovered in time to move for a new trial under Rule 59(b)."¹⁵¹ Rule 60(b)(2) currently has two significant limitations.¹⁵² First, it requires that the evidence existed at the time of trial.¹⁵³ It is unclear whether new epidemiological or scientific studies satisfy this requirement because while the scientific "fact" existed before trial (in the sense that it has always existed), the scientific studies did not.¹⁵⁴ Second, 60(b)(2) requires that motions

which it is based has been reversed or otherwise vacated, or it is no longer equitable that the judgment should have prospective application; or (6) any other reason justifying relief from the operation of the judgment. The motion shall be made within a reasonable time, and for reasons (1), (2), and (3) not more than one year after the judgment, order, or proceeding was entered or taken

FED. R. CIV. P. 60(b).

149. MOORE ET AL., *supra* note 143, § 131.21, at 131-40 to -41 (reporting that "the exception (if indeed it is an exception) is much narrower than the language used in some of the cases implies").

150. See *Bankers Mortgage Co. v. United States*, 423 F.2d 73, 77 (5th Cir. 1970) ("The provisions of this rule [60(b)] must be carefully interpreted to preserve the delicate balance between the sanctity of final judgments, expressed in the doctrine of *res judicata*, and the incessant command of the court's conscience that justice be done in light of *all* the facts.").

151. FED. R. CIV. P. 60(b)(2).

152. Besides the two limitations discussed here, Rule 60(b)(2) also requires that the new evidence be noncumulative and outcome determinative. See *infra* Part III.D.3.

153. See *Johnson v. Offshore Express, Inc.*, 845 F.2d 1347, 1358 (5th Cir. 1988) (holding that the "[n]ewly discovered evidence' under Rule 60(b)(2) . . . must be evidence of facts existing at the time of the original trial"); see also 11 CHARLES ALAN WRIGHT ET AL., *FEDERAL PRACTICE AND PROCEDURE* § 2808 (2d ed. 1995).

154. See *Merrell Dow Pharm., Inc. v. Oxendine*, 649 A.2d 825, 830 (D.C. 1994) (discussing the difficulties of making this determination). It is possible to interpret the requirement as merely an attempt to exclude postjudgment relief for so-called "changed circumstances"; in that case, new scientific studies about existent facts should qualify for relief. Professor Green, however, believes that the argument proves too much because new scientific evidence will always be about a fact that existed at trial. See Michael D. Green, *The Road Less Well Traveled (and Seen): Contemporary Lawmaking in Products Liability*, 49 DEPAUL L. REV. 377, 394 n.96 (1999).

for relief be made within one year of final judgment.¹⁵⁵ The one-year window is clearly insufficient for handling changing scientific evidence and would have to be expanded to account for the lengthier life cycle.

Another relevant subsection is 60(b)(5), which creates an exception to *res judicata* when it is "no longer equitable that the judgment should have prospective application."¹⁵⁶ Rule 60(b)(5), however, grants only prospective relief,¹⁵⁷ and may only be useful in class actions¹⁵⁸ or other cases in which funds are set up for periodic distribution. And because funds (however arranged) are essentially money damage payments, even they may not qualify for 60(b)(5) relief under current practice.

Finally, Rule 60(b) in general states that it "does not limit the power of a court to entertain an independent action to relieve a party from a judgment."¹⁵⁹ There is no time limit on an independent action for relief, except for laches,¹⁶⁰ but the traditional doctrine requires fraud or mistake and is extremely strict.¹⁶¹ That requirement probably precludes use of independ-

155. FED. R. CIV. P. 60(b).

156. FED. R. CIV. P. 60(b)(5). Unlike Rule 60(b)(2), which seems to disfavor changed-circumstances arguments, 60(b)(5) embraces them. *Cf.* *FDIC v. Alker*, 234 F.2d 113, 116 n.4 (3d Cir. 1956) (suggesting that 60(b)(5) only applies to cases in which judgment "is rendered prospectively inequitable by subsequent events"); 11 WRIGHT ET AL., *supra* note 153, § 2863, at 332-33, 337-38, 337 n.13 (observing that courts are more willing to grant this form of relief when judgment is prospective and there is no disentangling of previous payments).

157. FED. R. CIV. P. 60(b)(5). This limitation presumably comes from 60(b)(5)'s origins in the general power of an equity court to modify a final decree. *See* 11A WRIGHT ET AL., *supra* note 153, § 2961, at 391-93; *accord* *United States v. W. Elec. Co.*, 46 F.3d 1198, 1202 (D.C. Cir. 1995); *N.Y. State Ass'n for Retarded Children, Inc. v. Carey*, 706 F.2d 956, 967 (2d Cir. 1983) ("The power of a court of equity to modify a decree of injunctive relief is long-established, broad, and flexible."); *cf.* *Miller v. French*, 530 U.S. 327, 344-45 (2000) (holding that injunctive relief does not constitute a final judgment for purposes of separation-of-powers analysis under *Plaut v. Spendthrift Farm, Inc.*, 514 U.S. 211 (1995)).

158. Given that 60(b)(5) originated in the courts of equity, the similarly equitable origins of the class action suit may render it particularly susceptible to 60(b)(5) relief. *See* *Hansberry v. Lee*, 311 U.S. 32, 41 (1940) ("The class suit was an invention of equity to enable it to proceed to a decree in suits where the number of those interested in the subject of the litigation is so great that their joinder as parties in conformity to the usual rules of procedure is impracticable.").

159. FED. R. CIV. P. 60(b).

160. *Crosby v. Mills*, 413 F.2d 1273, 1276 (10th Cir. 1969).

161. *See* *Bankers Mortgage Co. v. United States*, 423 F.2d 73, 79 (5th Cir. 1970). The requirements for relief under an independent action are:

(1) a judgment which ought not, in equity and good conscience, to be

ent actions for relief in cases of changing scientific evidence.

The significance of these 60(b) exceptions is not that they can currently provide relief in changing scientific evidence cases. Indeed, they likely cannot. Rule 60(b)(2) has a one-year limitation; 60(b)(5) offers only prospective relief; and independent actions require fraud or mistake. What is important, however, is that the exceptions demonstrate that *res judicata* has been relaxed in the past for certain, albeit narrowly defined, cases.¹⁶² They thus provide departure points for future legislation or common law development.¹⁶³

2. Benefits

The primary benefit of using postjudgment relief to address changing scientific evidence is that it eliminates the waiting costs that plague delay mechanisms. Deciding cases immediately and distributing awards assures victims adequate funds for medical treatment in the interim. Plaintiffs no longer have

enforced; (2) a good defense to the alleged cause of action on which the judgment is founded; (3) fraud, accident, or mistake which prevented the defendant in the judgment from obtaining the benefit of his defense; (4) the absence of fault or negligence on the part of defendant; and (5) the absence of any adequate remedy at law.

Id. (quoting *Nat'l Sur. Co. v. State Bank of Humboldt*, 120 F.2d 593, 599 (8th Cir. 1903)).

162. There is even subsection 60(b)(6), which grants relief in "extraordinary circumstances" and only when such action is necessary to accomplish justice." *Lyons v. Jefferson Bank & Trust*, 994 F.2d 716, 729 (10th Cir. 1993) (quoting *Liljeberg v. Health Servs. Acquisition Corp.*, 486 U.S. 847, 863 n.11 (1988)); see also *FED. R. CIV. P. 60(b)(6)*; cf. Kara L. McCall, Comment, *Medical Monitoring Plaintiffs and Subsequent Claims for Disease*, 66 U. CHI. L. REV. 969, 996 (1999) (suggesting that although "60(b)(6) is used only rarely, it may provide a textual hook for a court seeking to allow a second suit based on development of disease").

163. Indeed, many courts have read the exceptions not as discrete, autonomous safety valves, but as part of a holistic policy that grants relief from final judgments when justice (or policy) warrants it. See, e.g., *In re Four Seasons Sec. Laws Litig.*, 502 F.2d 834, 841 (10th Cir. 1974) (suggesting that when "the motion is timely filed under any of the 60(b) clauses, the court should not be bound by a strict categorization of particular claims"); *Bankers Mortgage*, 423 F.2d at 77 n.7 (noting that a 60(b) motion and an independent motion for relief can be treated interchangeably as long as the adverse party is not prejudiced); Note, *Federal Rule 60(b): Relief from Civil Judgments*, 61 YALE L.J. 76, 82 (1952) (observing that the Supreme Court's principle that the clauses of 60(b) "are mutually exclusive has not been adhered to in practice"); *id.* at 84-86 (advocating the abolition of the time limit on 60(b)(3) because courts use 60(b)(6) to evade the one-year limitation anyway). But see *Four Seasons*, 502 F.2d at 841 (refusing to allow 60(b)(6) to "frustrate the one-year limitation").

to wait an additional four or five years for their recovery.

Postjudgment relief also exhibits the advantages characteristic of delay mechanisms that operate late in the litigation process. Because trial is conducted right away, evidence of specific causation does not degrade. In addition, as awards are made immediately, there is no longer any danger of defendants squandering or otherwise depleting their assets en route to bankruptcy.¹⁶⁴

Finally, because defendants are able to reclaim adverse judgments if science changes during the contingency period, they will continue to have significant incentives to conduct and fund research. Of course, the threat of future lawsuits created by an adverse judgment always creates incentives for research, but to the extent that class actions resolve most future claims and thereby squelch research under current practice, expanding postjudgment relief would improve incentives in that context.

3. Burdens of Proof

Unlike pretrial delays, which simply facilitate the introduction of more evidence, any posttrial mechanism¹⁶⁵ must grapple with the question of how much contrary evidence is necessary to overturn a previous jury decision or warrant a retrial. Current 60(b)(2) doctrine sets an extremely high standard of review: New evidence must be noncumulative¹⁶⁶ and outcome determinative.¹⁶⁷ Presumably, this high standard is meant to preclude bothersome and fruitless relitigation in ordinary cases.¹⁶⁸ Such a difficult standard of review, however, may be

164. See Abraham, *supra* note 102, at 868–69 (observing that long delays between the actions that produce injuries and the final resolution of tort claims offer greater opportunities “for the commercial creditors and owners of the responsible enterprise to divert their assets and thereby to preclude tort claimants from recovering their losses”).

165. This includes not only 60(b)-type postjudgment relief, but also the posttrial delays discussed in Part III.C.4.

166. WRIGHT ET AL., *supra* note 153, § 2859, at 307–08.

167. *E.g.*, Brown v. Petrolite Corp., 965 F.2d 38, 50 (5th Cir. 1992) (stating that a 60(b)(2) motion requires that the evidence is “material and controlling and clearly would have produced a different result”); see also McCall, *supra* note 162, at 995 (reporting that 60(b)(2) attempts are rarely successful because courts have often found the new evidence not to be outcome determinative).

168. Merrell Dow Pharm., Inc. v. Oxendine, 649 A.2d 825, 832 (D.C. 1994) (suggesting that, without the high bar of outcome determinacy, the continual availability of new information would make the 60(b)(2) regime unworkable);

undesirable in the changing scientific evidence context. To the extent that one expects the scientific literature to mature and improve over time, there is no reason why early guesses by fact finders should carry overwhelming weight. After all, the primary reason for selecting a 60(b)-type solution over a delay-type solution is to provide plaintiffs access to interim funds, not to raise bars for defendants.

In the end, however, any flexibility in modifying the standard for postjudgment relief in the changing scientific evidence context may be restricted by constitutional considerations.¹⁶⁹ The right to jury trial may require a standard at least as stringent as that used for judgments as a matter of law. Such a limitation would clearly hinder the operation of a postjudgment relief solution, but in theory it would remain available in egregious cases of scientific reversals, such as the silicone and spermicide cases.¹⁷⁰

4. The Problem of Defendant Recovery

Even if postjudgment relief sounds promising in the abstract, the financial situation of disease-stricken plaintiffs raises concerns about its practical feasibility. Plaintiffs often will be of limited means and may spend most if not all of the judgment on medical expenses and other needs during the contingency period. In other words, even if defendants succeed in

see also Stine, *supra* note 142, at 498 (arguing that “[m]ultiple studies could translate into multiple re-openings”).

169. See, e.g., *Castano v. Am. Tobacco Co.*, 84 F.3d 734, 750 (5th Cir. 1996); *In re Rhone-Poulenc Rorer, Inc.*, 51 F.3d 1293, 1303 (7th Cir. 1995) (describing the Seventh Amendment as providing “a right to have jurable issues determined by the first jury impaneled to hear them . . . and not reexamined by another finder of fact”); Nagareda, *supra* note 4, at 302, 302 n.24 (elaborating on the Seventh Amendment reservations of courts to allow the reexamination of jury verdicts).

170. Seventh Amendment doctrine, of course, rests on a historical inquiry based on the traditional distinctions between law and equity. See *Curtis v. Loether*, 415 U.S. 189, 193 (1974). Thus, to the extent that the changing scientific evidence problem occurs in complex litigation, the controversy surrounding whether class actions are in law or in equity offers the possibility that the right to jury trial would not apply in those cases at all. Compare Morris S. Arnold, *A Historical Inquiry into the Right to Trial by Jury in Complex Civil Litigation*, 128 U. PA. L. REV. 829, 848 (1980) (“There . . . seems to be no good historical foundation for the argument that plaintiffs may be denied the right to a jury trial because their cases are complex.”), with Patrick Devlin, *Jury Trial of Complex Cases: English Practice at the Time of the Seventh Amendment*, 80 COLUM. L. REV. 43, 65–77 (1980) (arguing that juries were not historically used in complex cases).

obtaining postjudgment relief, it may be a rather hollow victory.

A partial solution to the judgment-proof plaintiff problem would be to structure liability awards into something akin to a trust fund during the contingency period.¹⁷¹ The trust fund would pay out periodically to cover necessary medical expenses, and only at the expiration of the contingency period would the plaintiff then be entitled to the remainder. Perhaps surprisingly for some, such a periodic payment scheme would be a minimal departure from current practice, and is quite consistent with various state statutes permitting the imposition of periodic payments in medical malpractice cases.¹⁷²

Trust funds are not perfect. They guarantee defendants recovery of only a fraction of the original judgment.¹⁷³ Indeed, depending on the medical condition of the plaintiff, the guaranteed fraction may be extremely small. At the same time, they deprive ultimately vindicated plaintiffs of full use of their award during the contingency period, a hardship particularly poignant for plaintiffs with terminal illnesses. Nonetheless, trust funds may represent a reasonable compromise by allowing plaintiffs to have some interim funds while also guaranteeing defendants a meaningful possibility of postjudgment relief.

5. Searching for Certainty

The expanded possibility of postjudgment relief may also be highly unsettling to both plaintiffs and defendants. Suffer-

171. The problem of the judgment-proof plaintiff would disappear entirely if one could replace individual plaintiffs with large, well-funded health insurance companies, as advocated by David Rosenberg. Rosenberg's proposal of removing limits on first-party insurance subrogation would allow large first-party insurers to aggregate their clients' claims and sue risk-creating manufacturers for risk-based harms. See FRIED & ROSENBERG, *supra* note 101, at 101–02. Besides eliminating the judgment-proof plaintiff problem, the scheme would also minimize litigation costs because insurers could take advantage of scale economies and would not theoretically need to prove specific causation (since the insurers would represent the general population). *Id.* at 100–02.

172. Ellen S. Pryor, *After the Judgment*, 88 VA. L. REV. 1757, 1771–74 (2002) (discussing the rise of statutes permitting mandated periodic payments over the past twenty-five years). Some of these statutes even relieve defendants of certain payment obligations upon the plaintiff's death. See, e.g., *id.* at 1773 n.49 (providing other examples).

173. Plaintiffs' attorneys' fees could also be subject to recapture, further minimizing the gap. Putting attorneys' fees at risk would have the added advantage of encouraging plaintiffs' attorneys to bring suit only when the scientific evidence is reasonably mature or is sufficiently robust to suggest that it will be confirmed by future studies.

ing from an illness and perhaps wanting to get on with their lives, plaintiffs may find it unnerving—or at least unpleasant—to live with the possibility of having their “award” taken away several years later. Defendants will have similar concerns, presuming that postjudgment relief is symmetric and available to plaintiffs as well. The threat of future liability and possible insolvency hinders a corporation’s access to financial markets and other business opportunities, and weakening finality may make it more difficult for defendants to reestablish themselves in the business world.¹⁷⁴

The quickest method of reaching certainty is, of course, settlement.¹⁷⁵ But even without settlement, one could expect that some type of insurance or security market would develop to address these uncertainties. For example, risk-averse plaintiffs might sell their trust funds to risk-neutral financial institutions in exchange for a risk-discounted (but guaranteed) lump sum. These financial institutions could then diversify the risk of changing scientific evidence among multiple cases. Defendants might similarly buy insurance to protect against plaintiffs’ reopening judgments and obtaining larger awards.

Whether insurance companies or other financial institutions would be willing to insure these types of risks is unclear. Though it can presumably be modeled, the probability that scientific evidence will change is not necessarily as easy to calculate as the probability of automobile accidents or home fires. Furthermore, the absence of a large number of litigated toxic substances may make risk diversification difficult, especially when the aggregate amounts at stake for any particular substance are immense.¹⁷⁶ These problems may explain why many

174. See Abraham, *supra* note 102, at 869 (suggesting that resolving claims early removes the “sword of Damocles” that inhibits the availability of capital markets and mergers); Feldman, *supra* note 12, at 43 (arguing that it will be difficult for defendants “to keep their business affairs in good order if it took longer than it already does to put a price tag on liability exposure”).

175. Since settlement’s only purpose is arguably to reduce litigation risks and to ensure certainty, postjudgment relief would not be available against settlements negotiated on the basis of later-discredited scientific evidence. Cf. Stine, *supra* note 142, at 497–98 (arguing that a reopen clause in a settlement agreement would not help any side because it would cause “the matter to remain in flux for years”).

176. For example, in the aftermath of September 11th, skyscraper owners expressed concern about obtaining adequate terrorism insurance without government intervention. Joseph B. Treaster, *Senate Passes Aid to Insurers on Terrorism*, N.Y. TIMES, June 19, 2002, at C1.

accident risks at present lack viable insurance markets.¹⁷⁷

CONCLUSION

In the summer of 2002, a study by the Women's Health Initiative reported that the hormone replacement therapy drug Prempro increased women's risks of breast cancer and various forms of heart disease.¹⁷⁸ By week's end, the first class action suit had already been filed against Prempro manufacturer Wyeth Laboratories.¹⁷⁹ The Women's Health study appears to be scientifically solid,¹⁸⁰ and future studies may ultimately confirm that Prempro is indeed hazardous. But the surprising nature of the results and the flurry of activity sparked by the report suggest that researchers will be busily verifying the study in the near future.¹⁸¹ Courts may be once again facing another

177. See FRIED & ROSENBERG, *supra* note 101, at 26.

178. Writing Group for the Women's Health Initiative Investigators, *Risks and Benefits of Estrogen Plus Progestin in Healthy Postmenopausal Women: Principal Results from the Women's Health Initiative Randomized Controlled Trial*, 288 JAMA 321 (2002); see also Suzanne W. Fletcher & Graham A. Colditz, *Failure of Estrogen Plus Progestin Therapy for Prevention*, 288 JAMA 366 (2002) (discussing Prempro as the medication used in hormone replacement therapy).

179. See *National Class Actions Filed over Estrogen Replacement Drug*, ANDREWS MASS TORT LITIG. REPORTER, Aug. 2002, at 14; Ronald D. White, *Wyeth Hit with Class Action Alleging Damage from Drug*, L.A. TIMES, July 12, 2002, at C3. Within a month, there were already six class actions pending against Wyeth, not only in the Eastern District of Pennsylvania, but also in the Northern District of Illinois and state courts in Pennsylvania and Florida. *Wyeth Reports 6 Pending Prempro Class Actions*, 1 MEALEY'S PROD. LIAB. & RISK 21 (2002) (citing Wyeth's Form 10-Q filing with the Securities and Exchange Commission); see also, e.g., *Drug Preemption Defense Not a Federal Question; Prempro Class Remanded*, 3 MEALEY'S LITIG. REPORT: CLASS ACTIONS 24 (2003) (discussing the Prempro class action case in Alabama); TEX. LAW., Oct. 28, 2002, at 4 (describing the filing of *Sherry House Zanter v. Wyeth Pharmaceuticals* on October 18, 2002, in Bexar County, Texas, seeking \$10 million in actual damages and \$150 million in punitive damages).

180. Fletcher & Colditz, *supra* note 178, at 366–67. The Women's Health Initiative study used what is viewed as the “gold standard” for medical research—a randomized controlled trial. The thousands of participants were randomly assigned to either the placebo (control) group or the Prempro (experimental) group. Gina Kolata, *Hormone Studies: What Went Wrong?*, N.Y. TIMES, Apr. 22, 2003, at F1. Previous studies were at best observational studies, in which subjects reported and decided on their own usage of Prempro. *Id.*

181. Given the observed hazards, approval for another randomized clinical trial of Prempro is unlikely to be forthcoming. Jane E. Brody, *Sorting Through the Confusion over Estrogen*, N.Y. TIMES, Sept. 3, 2002, at F1. Researchers may, however, resort to other means of data collection, because Prempro will probably continue to be used when women and their doctors conclude that its benefits still outweigh its risks. See *id.*

case in which the applicable scientific evidence is not yet mature.

So what should the legal system do? This Article notes that one solution is to address the possibility of changing scientific evidence through delay mechanisms. Courts could take immediate steps to preserve the evidence of specific causation through depositions and interrogatories, and then stay the litigation in anticipation of confirmatory studies. To spur research, the length of the stay would be fixed, and could even be shortened if the judge determines that ethical or other considerations make further studies unlikely. In the interim, however, victims would be deprived of funds needed for medical treatment, and defendants could deplete their reserves or become insolvent.¹⁸²

As an alternative, this Article suggests a postjudgment relief mechanism. Courts could proceed without delay directly to judgment, but thereafter, during a predetermined contingency period, the judgment would remain open to assault if overwhelming contrary evidence should appear. Under this scheme, however, defendants would be the ones more likely disadvantaged. In the absence of a trust fund, it would be extremely difficult to recover from plaintiffs, who would invariably spend the reward on medical and other expenses. Even with a trust fund, only a fraction of the original judgment would remain protected.

Which solution is the better one? That may depend on one's confidence in early studies. If early studies are likely to be discredited by later ones, then the delay solution may be preferable. There is no reason to proceed to final judgment, tie up defendant resources, and risk their dispersal if the judgment will probably be reversed.¹⁸³ Likewise, if early studies are likely to be confirmed, then the postjudgment relief solution may be preferable. Then, at least plaintiffs will have the funds needed for treatment, while defendants still have a safety valve (albeit imperfect) for the relatively rare instances in which it is needed. Determining the general reliability of early studies, however, may well be impossible. We might try to examine the

182. See Melody Petersen, *Wyeth Stock Falls 24% After Report*, N.Y. TIMES, July 10, 2002, at A16.

183. At the same time, there is no reason to hold the preliminary studies inadmissible and grant the defendant summary judgment, because that would preclude plaintiff recovery even if later studies indeed confirmed the earlier ones.

problem empirically, but the sheer variety of how early studies are done—in rigor, sample size, technique, etc.—may swamp any attempt to derive a generally applicable trend. Besides, if we were really confident that an early study would be confirmed (or discredited), there would be little need to perform the confirmatory study in the first place. Indeed, the entire problem of changing scientific evidence would practically disappear.

So choosing the best solution may ultimately boil down to a policy choice over who should bear the interim risks and costs while the science matures. Under the delay mechanism, plaintiffs shoulder the waiting costs and risk future defendant insolvency. Under the postjudgment relief mechanism, defendants face the risk of being unable to recover erroneous judgments and lose the use of the disputed funds in the interim. Some will argue that defendants should bear the risks, emphasizing the responsibility of defendants for failing to perform adequate research, or focusing on plaintiffs in dire need of extensive medical treatment. Others will argue that plaintiffs should bear the risks instead, noting the higher incidence of judgment-proof plaintiffs and the social costs of depriving consumers of ultimately exonerated products.

But regardless of where one's sympathies lie, this Article suggests that there is one choice that is clearly wrong—and that is to do nothing at all. It is in that spirit that this Article hopes to mark the start of a difficult discussion on the problem of changing scientific evidence.