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The Use of Statistical Evidence of Identification in Civil Litigation: Well-Worn Hypotheticals, Real Cases, and Controversy.

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THE USE OF STATISTICAL EVIDENCE OF IDENTIFICATION IN CIVIL LITIGATION: WELL-WORN HYPOTHETICALS, REAL CASES, AND CONTROVERSY

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I. INTRODUCTION

The process of forensic proof, like many decisionmaking procedures, is a complex admixture of questions, some of which are easy and some of which are hard. What is curious, however, is that in law, unlike most other fields of endeavor in which factfinding is crucial, the incorporation of data in quantitative rather than qualitative form apparently is thought to make the decisions not easier, but more difficult. To be sure, numerical evidence and analysis is not unknown in the law,[1] but in the minds of many courts and individuals the possibility of "trial by the numbers" is greeted with open suspicion and hostility.[2] Is this reaction due to some inherent dissonance between the legitimate ends of judicial proof and the use of quantified data? Or is it more properly seen as only a kind of sociological fallout from the general unease with things mathematical felt by so many lawyers? As one author has put it, "Lawyers are wordsmiths, not number crunchers."[3] But is the explanation for this to be found in the nature of the law or the nature of lawyers?

This Article will examine one particular situation in which quantitative evidence might be helpful in the factfinding process, but in which the fact of its helpfulness is often contested and resisted. It will explore the problem, in the context of civil litigation, of what has become known as *naked statistical evidence* of identity. Briefly, naked statisti-

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1. *See generally* M. FINKELSTEIN, QUANTITATIVE METHODS IN LAW (1978); J. WEINSTEIN, J. MANSFIELD, N. ABRAMS, & M. BERGER, CASES & MATERIALS ON EVIDENCE 44-57 (7th ed. 1983) [hereinafter cited as J. WEINSTEIN]; George, *Statistical Problems Relating to Scientific Evidence*, in SCIENTIFIC AND EXPERT EVIDENCE (E. Imwinkelried 2d ed. 1981).

2. *See, e.g.*, Jaffee, *Comment on the Judicial Use of HLA Paternity Test Results and Other Statistical Evidence: A Response to Terasaki*, 17 J. FAM. L. 457 (1978-79); Tribe, *Trial by Mathematics: Precision and Ritual in the Legal Process*, 84 HARV. L. REV. 1329 (1971).

3. Kaye, *The Laws of Probability and the Law of the Land*, 47 U. CHI. L. REV. 34, 34 (1979).

cal evidence of identity refers to background statistical data offered by a plaintiff, unaccompanied by more conventional evidence, in an attempt to prove that the defendant before the court is the party responsible for his injury. For those to whom this brief description conveys little, the first portion of this Article will set out the question in more detail and, it is hoped, with more clarity. The situations presented do not require any great degree of mathematical sophistication. Indeed, most lawyers and law students, once presented with these problems react with a good deal of interest and enthusiasm. The field is filled with delightful posers that defy knee-jerk analysis.

As is usually true with the study of the law, the posing of such tricky cases is intended for more than mere amusement. The questions presented go to the very heart of the process. Consideration of when statistical evidence should be admissible at trial, and how it can dictate a result, quickly becomes an inquiry into the fundamental goals of forensic proof. The problem with naked statistical evidence turns out not to be a problem with statistics. Numbers are just numbers, they convey information in a different form, but not of a different kind. The problem we must acknowledge is one for the law and the legal process. It is a question of how we react—and how we believe we properly should react—to information when it comes to us packaged in this way. However timid lawyers may be about considering quantitative evidence, they cannot expect to resolve the problems by mindless deference to the "number crunchers" of other disciplines. These other disciplines can inform the law of the consequences of various decisions to be made; the decisions themselves, however, must be made closer to home.

After first setting forth the problem in more detail, this Article will review the actual experience of the courts in dealing with such statistical evidence of identification. It will be discovered that, contrary to what may be understood from many writers, the law's position on this matter is far from clear. Until recently, the law has not had to deal with the tough questions presented, if for no other reason than that such evidence of identification has rarely, if ever, been placed squarely before the court. Next, the subject as it has been treated by various academic writers will be considered. In contrast to the case law, the academic literature has had a long and rich history. Up to now, the problem of naked statistical evidence has come to life in the hypotheticals—not in the cases. One of the themes of this Article will be the extent to which this fact alone may have influenced the way we perceive the problem.

Consideration of hypothetical cases—neat and tidy, but too often tending to the cute and the clever—may be of considerable help to us. We want to be wary, however, lest their very simplicity screen out factors that have an effect on how actual cases appear to us. In the final portion of this Article, the recent spate of well-known and highly controversial cases involving the drug DES will be analyzed from a statis-

tical evidentiary viewpoint. Notwithstanding the consideration given to these cases in both the courts and the academic journals, it has not been generally recognized that the DES litigation is in many ways the well-worn hypotheticals come to life.[4]

II. SETTING THE QUESTIONS

In the American judicial system the outcome of civil litigation usually is determined by the preponderance of the evidence.[5] While this standard has been given different elaborations at various times, it is most often interpreted to mean that the plaintiff, to meet his burden in a civil suit and hence prevail, must convince the trier of fact that it is more probable than not that the factual assertions on which his case rests are true.[6] The reference to the notion of probability in such a statement is made, in most instances, in only a vague and common sense way. Legal writings rarely seem to make reference to, or have any awareness of the various theories of mathematical probability[7] that have been developed in the technical literature. Recently, however, legal writers have begun to suggest that a little bit of formalism may not be a bad thing. They have proposed that reference to some rudimentary propositions of formal probability theory, and even incorporation into law review articles of the kind of mathematical notation not usually found there, may be of assistance in considering matters of proof and decisionmaking in the trial context.[8]

The preponderance standard can be further explicated with only a minimum of mathematical handiwork to a statement in probability terms that one would expect to be subject to a minimum amount of controversy.[9] Suppose, for the sake of simplicity, that the plaintiff's

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4. Recently, two articles have appeared which recognize that the naked statistical evidence controversy has a bearing on the DES cases. *See* Callen, *Notes on a Grand Illusion: Some Limits on the Use of Bayesian Theory in Evidence Law*, 57 IND. L.J. 1, 35-36 (1982); Kaye, *The Limits of the Preponderance of the Evidence Standard: Justifiably Naked Statistical Evidence and Multiple Causation*, 1982 AM. B. FOUND. RESEARCH J. 487, 489-90.

5. *See* Brook, *Inevitable Errors: The Preponderance of the Evidence Standard in Civil Litigation*, 18 TULSA L.J. 79 (1982) (examining the preponderance of the evidence standard).

6. *Id.* at 81.

7. For a detailed treatment in the legal literature, see Cullison, *Probability Analysis of Judicial Fact-Finding: A Preliminary Outline of the Subjective Approach*, 1 U. TOL. L. REV. 538, 559-63 (1969).

8. See the various authorities cited by J. WEINSTEIN, *supra* note 1, at 44-57.

9. *See* Brook, *supra* note 5, at 81-86. *But see* Tyree, *Proof and Probability in the Anglo-American Legal System*, 23 JURIMETRICS J. 89 (1982). For those unfamiliar with basic probability, see generally W. CURTIS, STATISTICAL CONCEPTS FOR ATTORNEYS 45-57 (1983); 2 K. YEOMANS, APPLIED STATISTICS—STATISTICS FOR THE SOCIAL SCIENTIST 24-27 (1968).

hope of success in a particular case comes down to his proof of a single disputed matter of fact.[10] Under the conventional axioms of probability theory, the probability of any statement being true is represented by a real number between zero and one. The greater the number, the more probable it is that the statement is true. A probability of zero is taken to indicate that an allegation is certainly false, a probability of one as equivalent to its certainly being true. A further property of the conventional probability definition is what is often called the negation principle. This is the axiom which states that the sum of the probability of a statement's being true plus the probability of its not being true must equal one. This is the property of the formal mathematical structure that corresponds to our belief that every factual statement is either true or false. If we wish to use this definition of probability as a model for decisionmaking at trial, it follows that the requirement that the plaintiff show his disputed assertion to be "more probable than not" is the equivalent of the need to show that the probability of the assertion being true is greater than 0.5.[11]

While there has been and may continue to be some disagreement with an interpretation of the civil burden of persuasion as anything over 0.5 probability,[12] this conceptualization of the rule has gained wide acceptance.[13] Of course, presentation of evidence and jury deliberations are rarely carried out by the numbers; therefore, such a conceptualization may strike us as unnecessarily precise or merely fanciful. Viewing the burden in this way, however, allows us to make statements about the decisionmaking process that are far from trivial. In particular, it can be shown that the use of a greater than 0.5 rule in civil litigation carries with it a consequence that can indeed come to be seen as its principal justification. It can be proved, either in a rough handwaving way[14] or by a fullblown, albeit elementary, mathematical derivation[15] that a decision rule of this form, over the long run, will generate the minimal number of erroneous decisions. No rule is perfect.

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10. An entirely separate set of problems must be faced if we broaden the question to include situations involving several disputed facts. *See* Schum, Book Review, 77 MICH. L. REV. 446 (1979) (*A Review of a Case Against Blaise Pascal and his Heirs*); Wagner, Book Review, 1979 DUKE L.J. 1071 (reviewing L. COHEN, THE PROBABLE AND THE PROVABLE (1977)).

11. *See* Brook, *supra* note 5, at 81-82.

12. *See* Sargent v. Massachusetts Accident Co., 29 N.E.2d 825, 827 (Mass. 1940) (mathematical probability not sufficient); Lampe v. Franklin Am. Trust Co., 96 S.W.2d 710, 723 (Mo. 1936) (verdict must be based on what the jury finds to be the facts, not what they find to be more probable).

13. *See* MCCORMICK'S HANDBOOK OF THE LAW OF EVIDENCE § 339, at 794 (2d ed. 1972).

14. See M. FINKELSTEIN, *supra* note 1, at 66-67.

15. *See* Kaye, Book Review, 89 YALE L.J. 601, 605 n.19 (1980) (reviewing M. FINKELSTEIN, *supra* note 1).

When a key fact remains in dispute after all the evidence has been produced, the trier of fact will sometimes make a mistake by deciding that the truth lies with one party when in fact the situation is otherwise. Nevertheless, the rule of 0.5 or greater is the one that should be used if our goal is a rule that promises to minimize the total number of erroneous decisions.[16]

In some decisionmaking situations, simply minimizing the total number of errors without regard to the different *type* of errors that can occur will have limited appeal. Placing a heavier burden on the accusing party in criminal trials, for example, can be understood as reflecting a belief that convicting an innocent person is decidedly different and more feared than other errors that could occur.[17] In the civil situation, however, the rule of greater than 0.5 can be taken to stand for the affirmative proposition that errors are bad and should be avoided to the greatest extent possible. Furthermore, in civil litigation, errors that work against plaintiffs and defendants are viewed as equally bad. In a civil trial, unlike in a criminal trial, neither side is favored in the eyes of the law.[18] If we agree that erroneous determinations are bad, and if we agree upon no other competing goal that must be balanced against error minimization, then the theory of probability and the rule of greater than 0.5 appear to be the appropriate route to take.[19]

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16. Professors Brilmayer and Kornhauser have criticized statements such as those in the text if they are intended to mean that we would know for certain that using this decision rule results in the minimal number of errors that we could experience.

> [I]t is wrong to say that if we affirm a proposition in which we have a degree of belief of more than one-half "we would be right more than half the time." We have not the slightest assurance that any of the evidence on which we base our judgment is correct—how then can we *know* what percentage of times it is true? A more accurate statement of the Bayesian view is that if we have a degree of belief of .51, this figure is the equivalent of saying that we *think* that out of one hundred cases we would be right fifty-one times, not that we *would* be correct fifty-one times.

Brilmayer & Kornhauser, Book Review, 46 U. CHI. L. REV. 116, 140-41 (1978) (footnote omitted) (emphasis in original) (reviewing M. FINKELSTEIN, *supra* note 1). True, we can never be certain how well our chosen decision rule serves its function; this uncertainty is inherent in our having to formulate a rule to apply to situations involving unavoidably imperfect information. Nevertheless, selecting a rule that we *think* would minimize errors is easily defensible—as long as we know of no other rule that we *think* would do better.

17. *See* Kaplan, *Decision Theory and the Factfinding Process*, 20 STAN. L. REV. 1065, 1073-77 (1968).

18. *See* Brook, *supra* note 5, at 85-86. *But see* Tyree, *supra* note 9, at 93-94.

19. It should be emphasized that the statement in the text asserts a necessary conclusion only if certain assumptions are true or agreed upon. No claim is being made that these assumptions are correct or ones that necessarily must be made. People often argue against probabilistic analysis in law as if it were an attempt to lay to rest once and for all any controversy about how trials should proceed. This misunderstands the

This is all well and good and it may give the academic writers and theoreticians something to think about, but what does it have to do with the course of an individual trial? In trial, the evidence presented is going to be sufficiently imprecise and nonquantified that the mathematical exactitude suggested by this rendition of the preponderance standard seems to have little practical relevance. Understanding the plaintiff's burden in a more imprecise way—some notion akin to letting the better person win—would appear to do just fine. The potential differences begin to take shape, however, if we assume for a moment that one party offers evidence of a quantitative nature intending to rely on it exclusively. Then how do the numbers stack up?

The problem we wish to consider is well represented by a classic hypothetical.[20] Suppose that a Mrs. Smith has had an auto accident; her car was forced off the road by a bus as she drove down Main Street. She brings suit against the Blue Bus Company, a particular carrier operating in the city, for her injuries. At trial the only fact in controversy is whether the bus that ran Mrs. Smith off the road was owned and operated by the defendant. The fact that the bus in question had been negligently driven and that the owner of that bus—once identified—should pay Mrs. Smith for her injuries is not in dispute. The plaintiff, Mrs. Smith, offers no evidence about the specific bus that caused her accident. She presents no proof of which particular bus or bus driver of the Blue Bus Company was involved. Instead, she offers evidence that some specific percentage, say eighty percent, of all buses that travel down Main Street during the time of the accident are owned and operated by the Blue Bus Company. The plaintiff claims to have proved her case by the only standard she needs to meet, proof by a preponderance of the evidence. The defendant argues that Mrs. Smith has proved nothing of the sort because she has offered no evidence that would link its buses to the incident. As the law school professor might say, what result? If we are to remain true to our stated criterion of proof only by a preponderance of the evidence, do the hard "scientific" figures before the court compel a judgment for the plaintiff? Alternatively, is the defendant correct in claiming that the overall background statistics on buses taking the Main Street route have noth-

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nature of the analysis. Whether error minimization should be the sole goal of judicial factfinding in civil cases is an issue that this analysis can bring into focus, and on which this Article may shed some light. This analysis, however, does not purport to completely answer this difficult question, because the question also involves a matter of values, policy, and human choice.

20. *See* E. GREEN & C. NESSON, PROBLEMS, CASES AND MATERIALS ON EVIDENCE 51 (1983). This hypothetical appears to have first surfaced in Tribe, *supra* note 2, at 1340-41. It clearly was inspired by the case of Smith v. Rapid Transit Inc., 58 N.E.2d 754 (Mass. 1945), which is discussed *infra* text accompanying notes 33-42. As the text will indicate, this hypothetical, while inspired by the *Smith* case, differs from it in a fundamentally important way.

ing to do with the unique case before the court? Is there some intermediate position possible, and if so what could it be?

The Blue Bus Company hypothetical is a classic, and we can see why: like all good hypotheticals it raises more questions than it answers. It stands ready to take on different colorations as different assumptions are added to it. The arguments that this and other similar hypothetical situations have engendered are the subject of this Article. We have no embarrassment about basing our discussion on such fictional situations, although it may appear to be mere gamesplaying to those unfamiliar with the way ideas take shape in the law. At the same time, we want to remain sensitive to the possibility that there are limits to just how far such purified thought experiments can take us. The ultimate goal is to decide and understand cases—not hypotheticals. For this reason, we will first turn to the case law.

III. THE EXPERIENCE OF CASE LAW

A. *Some Cited Cases*

The debate that swirls around the questions raised by the Blue Bus Company hypothetical centers on our concern for what the courts *should do* in such instances. While this ultimately is a reasonable and worthy goal for our study, it is curious how little attention is given to a separate but important question. That question concerns what might be thought of as the logical starting point for such an investigation: what have the courts *actually done* when confronted with this type of evidence? To the extent that this latter question is even addressed, what is even more surprising is the ease with which most writers seem able to satisfy themselves regarding the answer. It is simply asserted that the courts have not allowed plaintiffs to prove crucial elements of their cases in civil litigation by statistical evidence alone. We are told that the law, whether rightly or wrongly, has spoken.

Consider, for example, an often noted passage by Professors Henry M. Hart, Jr., and John T. McNaughton. They state:

> [T]he law refuses to honor its own formula [that the plaintiff need prove his case only on a "more likely than not" basis] when the evidence is coldly "statistical." A court would not, for example, hold the government liable to a farmer for injuries inflicted on him by his mule frightened by a "buzzing" jet plane if the only evidence that the pilot was a member of the Air Force (rather than a civilian) was that most of the pilots flying jets that day were Air Force personnel. This would be true even though the farmer could show that as much as 70 or 80 per cent of the jet pilots in the vicinity that day were of the Air Force.[21]

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21. Hart & McNaughton, *Evidence and Inference in the Law*, in EVIDENCE &

The authors of this passage offer no authority for their statement of what a court *would do* in this case, but it seems fair to conclude that they had in mind the case of *Sawyer v. United States*,[22] decided by a federal court in Georgia only two years earlier. The mule's name was Emma. Frightened by a low-flying jet, she ran off—pulling her owner head-first through the plowed field. The farmer, injured in the incident and forced by his injuries to give up year-round farming, brought suit against the federal government. Although the plaintiff, whose eyes and mouth became filled with dirt during the incident, never saw the airplane involved, some farmers in a nearby field did. They testified to having seen markings on the plane identifying it as an Air Force aircraft.[23] The trial judge was inclined to infer from the evidence that the plane was owned by the United States, that its operator or operators were negligent in flying too low, and furthermore, "that Emma and the plaintiff were entirely without fault."[24] The judge concluded, however, that "such findings and inferences would avail the plaintiff nothing."[25]

Why could the plaintiff not collect? The court explained that under the Federal Torts Claim Act,[26] the government's ownership of the aircraft was not enough to establish liability.[27] The statute provides that the negligent act must have been performed by a government employee while acting in the scope of his employment.[28] In this case, Emma's owner had offered no evidence to establish who had been the pilot of the offending aircraft, or even that the pilot was a government

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INFERENCE 48, 54 (D. Lerner ed. 1958). While the authors state this would be the result in a court, they do not necessarily defend it. They continue:

> The court, on the other hand, would certainly allow recovery if the evidence was that 100 per cent of the pilots were Air Force personnel, and would probably allow it if all of them were except a negligible few. Similarly, the court might allow recovery if the farmer, instead of introducing the statistical evidence, testified that he got a fleeting glimpse of the pilot's cap and that it was distinctively Air Force headgear. The court somehow feels more comfortable permitting a finding to be based on such eye-witness testimony even though the probative value of such testimony is itself determined ultimately by home-spun "statistics" in the mind of the trier of fact and even though the eye-witness testimony is probably no more indicative of the truth than is the evidence as to the proportion of Air Force pilots in the air.

Id. For other statements suggesting that courts would clearly not allow a case to go forward on statistical evidence alone, see Cullison, *supra* note 7, at 573-74; Haverty, *Letter to the Editor*, 1980 CRIM. L. REV. 743-47; Nesson, *Reasonable Doubt and Permissive Inferences: The Value of Complexity*, 92 HARV. L. REV. 1187, 1194 (1979).

22. 148 F. Supp. 877 (M.D. Ga. 1956).
23. *Id.* at 878.
24. *Id.*
25. *Id.*
26. 28 U.S.C. §§ 1346(b), 2671-2680 (1982).
27. 148 F. Supp. at 879.
28. *Id.* at 878; *see* 28 U.S.C. § 1346(b) (1982).

employee.[29] The court stated: "Every finding of fact must have some reasonable basis in the evidence and cannot rest wholly upon surmise and speculation. A verdict is without legal basis if the evidence does no more than furnish a springboard for conjecture and speculation."[30] This might seem like a foolish objection under the circumstances. Is it mere conjecture and speculation that an Air Force plane would be piloted by a government employee? It may be helpful in understanding the merit of this objection if we turn to a similar case that the court relied on heavily. In *Curtis v. United States*,[31] the court concluded that it could not infer from the fact of ownership alone that the planes there involved were operated by employees of the United States. The Court stated that "it is just as probable that they may have been operated by National Guard personnel, not in federal service although using federal equipment. Under such circumstances the defendant would not be liable."[32]

Whether it really was "just as probable," "more probable," or "less probable" that the offending aircraft in *Curtis* were being flown by National Guardsmen rather than government employees is impossible to tell. The opinion does not suggest that the court had before it any statistics on what proportion of flights during the relevant period were carried out by the two groups of pilots. Nor does it appear that such proof was offered in *Sawyer*. Neither case can be taken as a good indication of what either court would have done if it had been confronted with a body of well-prepared and reliable statistical information offered to prove the identity of the flier whose negligence caused the damage. It may be that, if the plaintiff in either case had tried to prove this crucial factor by offering evidence that some high proportion of overflying planes had been piloted by government employees, his attempt would have met a chilly reception. Nevertheless, we cannot be certain that this would have been the result. What is most striking about the cases from our point of view is not speculation about the courts' reactions to any such information, but the very absence of such an attempted proof. The case of Emma the mule may have inspired Professors Hart and McNaughton to create an interesting hypothetical situation on which they were free to speculate. It does not serve, however, as any kind of proof for whatever statements they may make about what the courts will do in such situations.

A similar comment must be made about the well-known case of

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29. 148 F. Supp. at 879.

30. *Id.*

31. 117 F. Supp. 912 (N.D.N.Y. 1953). In *Curtis* the plaintiff had suffered a loss when low-flying aircraft caused the destruction of a large number of young mink he was raising.

32. *Id.* at 913.

Smith v. Rapid Transit, Inc.[33] This is the case, decided by the Massachusetts Supreme Judicial Court in 1945, that is the obvious inspiration for the blue bus hypothetical that we presented earlier[34] and which has been the subject of so much academic interest. Writers may take from *Smith* the lesson that the court clearly would not approve of an attempt to establish the defendant's liability only on the basis of statistics representing the proportion of buses running down Main Street that are owned by the defendant.[35] It is important to note, however, that in the actual case it does not appear that the plaintiff ever attempted to use any such argument. All she established was that the defendant company was the only bus company to have been granted a franchise to operate a bus line for that particular route. The court pointed out that this did not preclude a private or chartered bus from using that street; therefore, "the bus in question could very well have been one operated by someone other than the defendant."[36] Again, the relevant question of whether a litigant would be allowed to prove by a preponderance of purely statistical evidence that the bus was owned by the defendant and not by another company was never tackled by the court. The plaintiff failed to provide any information, mathematical or otherwise, on this point.

To be sure the court's opinion in *Smith* does contain dicta, as well as a lengthy quotation from an earlier Massachusetts case,[37] that speak disparagingly of any notion that a party can prove his or her case solely by demonstrating that mathematical chance favors his or her side of the critical proposition. It is highly doubtful, however, that this language should be read as representing a thoughtful and deliberate response to the kind of question we are considering. It reflects more of an attempt by the Massachusetts court to advance a particular conception of the preponderance of the evidence standard that must be addressed on its own terms, regardless of the type of evidence the parties may introduce in an attempt to meet that standard. This interpretation, if adopted, would go beyond a mere dispassionate balancing of the evidence as presented by the two sides to the controversy. Instead, as the court in *Sargent v. Massachusetts Accident Co.*[38] concluded, a proposi-

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33. 58 N.E.2d 754 (Mass. 1945). *See* Brook, *supra* note 5, at 88-89.

34. *See supra* note 20 and accompanying text.

35. Professor Tribe acknowledges in a footnote that no statistical evidence was presented in *Smith*; however, he treats the case as if statistical evidence had been presented. Tribe, *supra* note 2, at 1341 n.37. Professor Tribe explains the result in *Smith* as standing for the requirement that some nonstatistical and individualized proof of identity must be offered before compelling a party to pay damages. *Id.* As the text explains, *Smith* can be interpreted in a far more simple and straightforward manner.

36. *Smith*, 58 N.E.2d at 755.

37. Sargent v. Massachusetts Accident Co., 29 N.E.2d 825 (Mass. 1940). *See* Brook, *supra* note 5, at 87-88.

38. 29 N.E.2d 825 (Mass. 1949).

tion could be proved by a preponderance of the evidence only "if it is made to appear more likely or probable in the sense that actual belief in its truth, derived from the evidence, exists in the mind or minds of the tribunal notwithstanding any doubts that may still linger there."[39]

This "actual belief" rule (as it came to be known) was advocated by several writers during the earlier part of this century and seems to have reached the height of its acceptance with these Massachusetts cases.[40] It is an attractive notion that the factfinder at trial can insist on being satisfied to some degree of belief, in fact to actual belief (whatever that is), before being called upon to make a decision. Unfortunately, the possibility that this phrase could accurately or fairly describe what the difficult job of factfinding at trial is all about vanishes under closer scrutiny.[41] The call for an actual belief requirement must be seen as a halfhearted attempt, by choice of words, to avoid facing squarely the fallibility of any system for making decisions based on imperfect information. However one might feel about how the court has chosen to characterize the standard to be met, it is apparent that what is said about the standard in *Smith* and *Sargent* cannot be taken as dispositive on the use of statistical evidence in and of itself. Whatever "actual belief" short of certainty and "notwithstanding any doubt that may still linger" may be, it is a description of the result of proof, not a characterization of the means by which such proof is to be made. It calls for a style of conclusion, not a style of proof. To require an actual belief, as opposed to proof by "mathematical chance" (if the court means any proof that is explicitly founded on probabilistic concepts), is to set up a false dichotomy. The state of mind that we are willing to label, for our purposes, as "belief" can come about in a variety of ways. Had the plaintiff in *Smith* actually brought forth reliable evidence that ninety-five percent of all buses traversing that route were owned by the defendant company, is there any way we could be sure that this would not lead to a belief in the jury's mind just as firm, if not more so, than would the testimony of one frail soul with poor eyesight standing far away at dusk? How would the Massachusetts court have reacted to a jury verdict for the plaintiff based on such an impressive figure? We do not know. It is certainly easier to dismiss such proof in dictum than it would be when confronted with it head on. Neither *Smith* nor *Sargent* is proof of the courts' disposition to reject any or all probabilistic evidence of identification. Both stand only for the much less controversial proposition that a plaintiff will fail if he is seen as offering no evidence at all on a crucial part of his case.[42]

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39. *Id.* at 827.

40. *See* Brook, *supra* note 5, at 89-92.

41. *Id.* at 95-96.

42. In both *Sargent* and *Smith*, no numerically expressed evidence or argument was made. The plaintiff in *Sargent* prevailed because the evidence was sufficient for the

Two additional cases that have been cited as evidence of what courts will do with naked statistical evidence[43] are different from those already mentioned in that there was at least some evidence in numerical form offered at trial. Still, neither stands as a particularly good example from which a conclusion should be drawn. In *Kamosky v. Owens-Illinois Glass Co.*,[44] the plaintiff was injured by an exploding beer bottle and sued a glass bottle manufacturer. He offered evidence that the defendant had supplied 6900 gross out of 7071 gross of new quart bottles used by the bottler during a five year period.[45] The defendant was able to show, however, that the bottles filled by the beer company also included empty used bottles that had been returned in cases to the bottler. Consequently, only between ten and fifteen percent of the bottles used by the beer company were new bottles.[46] Thus, the figures presented by the plaintiff only showed that the bottle which caused the injury *could have been* produced by the defendant. In fact, unless additional information was known about the origin of the used bottles, the figures tend to indicate that it was more likely than not that the defendant's product was not involved. This evidence is perfectly consistent with the directed verdict for the defendant[47] that was affirmed by the appellate court.[48]

In *Guenther v. Armstrong Rubber Co.*,[49] a tire exploded while the plaintiff was mounting it on a car. The tire involved had been taken from the scene of the accident and was produced at trial.[50] Counsel for the defendant tire manufacturer admitted that it was one of the company's tires. Only when the plaintiff testified that the tire which had exploded was different than the one present in the courtroom—a blackwall rather than a whitewall—did a dispute about the source of the tire surface.[51] The appellate court reversed a directed judgment for the defendant, reasoning that plaintiff's apparent confusion (after all, he had been knocked unconscious) did not so demolish his case as to

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jury to find the decedent did in fact die by accident. *See* 29 N.E.2d at 827. The plaintiff in *Smith*, however, lost because the identity of the bus responsible was a matter of conjecture; therefore, the evidence was not sufficient to support a jury verdict for the plaintiff. *See* 58 N.E.2d at 754-55.

43. *See* Nesson, *supra* note 21, at 1194 n.16.

44. 89 F. Supp. 561 (M.D. Pa. 1950), *aff'd per curiam*, 185 F.2d 674 (3d Cir. 1950).

45. *Id.* at 562.

46. *Id.*

47. *Id.* In Guenther v. Armstrong Rubber Co., 406 F.2d 1315 (3d Cir. 1969), which is discussed below, the court noted that in *Kamosky* "there was only a 10 to 15 per cent likelihood of liability of the alleged offending article." *Id.* at 1318.

48. Kamosky v. Owens-Illinois Glass Co., 185 F.2d 674 (3d Cir. 1950).

49. 406 F.2d 1315 (3d Cir. 1969).

50. *Id.* at 1316.

51. *Id.*

leave no issue of fact for the jury.[52] The appellate court did, however, uphold the trial court's refusal to allow the jury to consider the case on a probability hypothesis offered by the plaintiff.[53] This hypothesis—presumably offered after the plaintiff's statement about the type of tire involved threw his more conventional case into disarray—relied on the fact that seventy-five to eighty percent of the tires sold at the store where the tire was purchased were made by the defendant.[54] Although this argument did not sit well with either the trial or appellate court, it is hardly an instance of naked statistical evidence. One very real tire stood accused and it was present in the courtroom. The fact that the plaintiff's testimony confused the situation does not make all of this conventional evidence irrelevant. Naked statistical evidence, the argument goes, may dictate or support a result because it is the only credible evidence available on which to base a finding of fact that must be made. If other evidence of a more conventional sort is available, it easily can swamp the statistical evidence and greatly diminish its importance.[55]

B. *Introduction to the DES Cases*

The most interesting feature of the *Kamosky* and *Guenther* cases is that they are products liability cases in which market share data (albeit of a crude sort) was introduced. They point the way to a more recent line of cases of far greater importance. The recent wave of liti-

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52. *Id.* at 1318.

53. *Id.*

54. *Id.*

55. *See infra* text accompanying notes 142-48. One case that recently surfaced does bear a striking resemblance to the traditional hypotheticals, and it is one in which statistical evidence *was* deemed important. In Kaminsky v. Hertz Corp., 288 N.W.2d 426 (Mich. Ct. App. 1979), the windshield of the plaintiffs' car was struck by a large sheet of ice "which detached from the top of a passing yellow truck bearing the Hertz logo," seriously injuring the plaintiffs. At trial the parties stipulated that the truck was identified only by virtue of its yellow color and the Hertz logo, and that Hertz owned only approximately 90% of the vehicles that fit this description. *Id.* The other 10% were owned by licensees, or franchisees, or were vehicles sold without removal of the Hertz logo and colors. *Id.* at 427. The trial court granted summary judgment for the defendant, concluding that a jury could not find ownership by Hertz based on this information and that any verdict for plaintiff would be based on "guess and conjecture." *Id.* The Michigan Court of Appeals reversed and remanded for trial, holding that the "Hertz color scheme and logo establish a prima facie showing of ownership or control sufficient to prevent summary judgment. . . . The named firm may introduce evidence indicating lack of control or ownership. But such explanations are for the jury to evaluate and appraise in light of all the surrounding circumstances." *Id.*

It is interesting to note that *Kaminsky* came to light in a footnote reference in an article, one that poses yet one more ingenious hypothetical. *See* Kaye, *supra* note 4, at 487-88 n.4. As is usual in such hypotheticals, the extent of plaintiff's injuries is never mentioned. *See infra* text accompanying note 223.

gation involving the drug diethylstilbestrol, popularly known as DES, may in time tell us more about how statistical evidence of identity will be treated by the courts in civil litigation. The DES cases will be the focus of a later section of this Article,[56] but a brief introduction to the factual background will be helpful at this time. If nothing else, the DES cases present a real situation affecting thousands of people, not a hypothetical one involving a lone mule or a lone Mrs. Smith—a fact that the reader will want to keep in mind while reviewing the academic and abstract debate that follows.

Much comment already has been directed to the DES litigation.[57] It is estimated that over one thousand suits have been filed involving the drug;[58] therefore, no brief summary of these cases is going to be perfect. The principle identification problem common to many of the cases can, however, be outlined.[59] DES is a man-made estrogen first synthesized in 1938.[60] During the early 1950's, the drug was dispensed to pregnant women on the belief that it would reduce the risk of miscarriage. Only much later did the medical community recognize the dangers that the use of DES by pregnant women presented to their unborn children. While the full extent of the risks to these children is still unknown,[61] it is now generally accepted that this use of DES is responsible for a high rate of a rare form of cancer in the daughters of women who took DES while pregnant.[62]

Following conventional case law, if a daughter of a mother who took DES can establish in court the identity of the manufacturer whose product her mother used, that manufacturer may be held liable. Several DES suits have proceeded on this basis, with the plaintiffs offering

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56. *See infra* notes 203-23 and accompanying text.

57. *See, e.g.*, Fischer, *Products Liability—An Analysis of Market Share Liability*, 34 VAND. L. REV. 1623 (1981); Gillick, *The Essence of Enterprise Liability, Or the True Meaning of "We're All in This Together,"* 16 FORUM 979 (1981); Henderson, *DES Litigation: The Tidal Wave Approaches Shore*, 3 CORP. L. REV. 143 (1980); Kaye, *supra* note 4.

58. Podgers, *DES Ruling Shakes Products Liability Field*, 66 A.B.A. J. 827, 827 (1980).

59. For the factual background in greater detail, see Robinson, *Multiple Causation in Tort Law: Reflections on the DES Cases*, 68 VA. L. REV. 713, 717-20 (1982).

60. For the history of DES, see generally B. SEAMAN & G. SEAMAN, WOMEN AND THE CRISIS IN SEX HORMONES (1978).

61. There is speculation that DES may have had negative effects on the women who took the drug themselves and on their sons as well. *See* Comment, *Bearing the Burden of DES Exposure*, 60 OR. L. REV. 309, 313-14 (1981).

62. A probabilistic problem also potentially present in this situation is whether DES was the cause of plaintiff's cancer or whether the cancer would have developed without use of DES. Apparently the particular form of cancer associated with DES use is so unusual, except in the presence of the drug, that causation has not become an issue in the way the identification question has. This issue is distinct from the identification issue discussed below.

the kind of evidence that traditionally has been used in products liability cases to prove the source of the offending product.[63] The difficulty for a large number of plaintiffs, however, has been that no such evidence has been available. This lack of evidence is not hard to understand.

> The cancer caused by DES usually does not manifest itself for at least ten to twelve years, and more years may pass before the cancer is linked to DES. Needless to say, it is difficult to identify the commercial origin of drugs taken more than a decade earlier. Whatever records may have been maintained by the doctor or the pharmacy involved have typically been lost or destroyed. To make matters worse, it is estimated that between 200 and 300 manufacturers produced DES. Although most of the output appears to have been concentrated among six or seven manufacturers, considerable uncertainty remains as to which manufacturer produced the drug administered to a particular patient.[64]

To get around this difficult problem of proof, several plaintiffs have sued one or several of the large manufacturers of the drug. The plaintiff offers numerical evidence of the market share of the drug for which the defendant or defendants were responsible.[65] When this market share information is the exclusive evidence offered to prove the identity of the drug's manufacturer, the naked statistical evidence problem is presented in paradigm form. When the results of this ongoing spate of litigation are examined, we find some courts have ruled against any attempt by a plaintiff to prove her case by a market share argument.[66] But even these courts do not appear to have thought that such arguments were totally frivolous or that the offered information had no probative value. Other courts have given the market share analysis a much warmer reception. One case in particular, decided by the California Supreme Court, allowed the plaintiffs to recover on this data alone,[67] and other courts may be following suit.[68] The ultimate lesson to be learned from these cases is by no means clear. For our present

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63. See cases collected in Note, Payton v. Abbott Laboratories: *An Analysis of the Massachusetts DES Class Action Suit*, 6 AM J.L. & MED. 243, 247 n.22 (1980).

64. Robinson, *supra* note 59, at 721 (footnotes omitted).

65. It has been noted that once a cause of action is allowed under a market share theory it may be more difficult to establish a reliable and workable measure of market share than was initially thought. R. EPSTEIN, MODERN PRODUCT LIABILITY LAW 159-60 (1980).

66. *See, e.g.*, Gray v. United States, 445 F. Supp. 337 (S.D. Tex. 1978); Namm v. Charles E. Frosst & Co., 427 A.2d 1121 (N.J. Super Ct. App. Div. 1981).

67. Sindell v. Abbott Laboratories, 607 P.2d 924 (Cal.), *cert. denied*, 449 U.S. 912 (1980). *See infra* text accompanying note 203-07.

68. *See* Tell, *DES Class: The Reviews Are Mixed*, NAT'L L.J., July 26, 1982, at 3, col. 1 (discussing the Massachusetts Supreme Judicial Court's Advisory opinion in *Payton*).

purposes, it is fair to conclude that the experience of the DES litigation, even at this early stage, suggests a far greater willingness on the part of the courts to accept probabilistic analysis based on statistical data in civil litigation than writers responding to the earlier cases would lead us to expect.

C. *The Criminal Experience*

Perhaps the temptation to accept as settled the idea that naked statistical evidence of identification must run into stiff resistance in a civil trial is explained partly by the dismal track record that exists for proof by statistics in criminal cases. Prosecutors have tried for some time to prove through elaborate statistical analyses that astronomical odds exist against the possibility of the defendant's being innocent.[69] Consequently, unlike in the civil context, a number of courts in criminal cases have directly addressed the statistical evidentiary issue. In these cases, each of which has gained a certain notoriety of its own, evidence or argument in numeric form actually was introduced at trial. This evidence often seems to have "bowled-over" both the trial judge and the jury. Appellate review of these cases and the considerable comment on them,[70] however, have pointed out serious problems with these attempts at proof. In *People v. Collins*,[71] for example, the numbers relied on were not accurate and reliable statistics assembled in a scientific manner, but were figures apparently pulled out of thin air.[72] The mathematical analysis that was said to flow from these figures has been open to controversy and has been shown to be erroneous.[73]

With all of these problems—and with the distinct impression left by the cases of prosecutorial overreaching[74]—it is not surprising that

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69. *See, e.g.*, People v. Collins, 66 Cal. Rptr. 497 (1968) (en banc); State v. Sneed, 414 P.2d 858 (N.M. 1966); People v. Risley, 108 N.E. 200 (N.Y. 1915). Also see Professor Tribe's discussion of the use of mathematical evidence in the infamous French trial of Captain Alfred Dreyfus. Tribe, *supra* note 2, at 1332-34.

70. *See, e.g.*, Charrow & Smith, *A Conversation About "A Conversation About Collins,"* 64 GEO. L.J. 669 (1976); Cullison, *Identification by Probabilities and Trial by Arithmetic (a Lesson for Beginners in how to Be Wrong With Great Precision)*, 6 HOUS. L. REV. 471 (1969); Fairley & Mosteller, *A Conversation About Collins*, 41 U. CHI. L. REV. 242 (1974).

71. 66 Cal. Rptr. 497 (1968) (en banc).

72. *Id.* at 500. The prosecutor simply assumed certain probability factors *"[w]ithout presenting any statistical evidence whatsoever in support of the probabilities for the factors selected." Id.* (emphasis in original).

73. *See* Charrow & Smith, *supra* note 70; Fairly & Mosteller, *supra* note 70.

74. In the *Collins* case, the California Supreme Court reported that,

> although his technique could demonstrate no such thing, [the prosecutor] solemnly told the jury that he had supplied mathematical proof of guilt.
>
> Sensing the novelty of that notion, the prosecutor told the jurors that the traditional idea of proof beyond a reasonable doubt represented "the most hackneyed, stereotyped, trite, misunderstood concept in criminal law."

"trial by mathematics" has gotten such bad press.[75] Three points must be noted, however. First, in those cases in which appellate courts have spotted the problems with such evidence, the narrow reading of their holdings and the lessons from the large part of the academic criticism need be only that erroneous analysis and unsubstantiated statistics are inadmissible at trial. Even in *Collins*, the most notorious of the criminal cases, the California Supreme Court pointed out that its reversal of a criminal conviction that was based on the shoddiest mathematical proof was *not* meant to imply any "inherent incompatibility between the disciplines of law and mathematics and [that the court intended] no general disapproval . . . of the latter as an auxilliary in the fact-finding process of the former."[76] The possibilities for abuse inherent in any suggested addition to the arsenal of forensic proof are certainly of great concern to a court considering this new form of evidence. Nevertheless, the distinction between use and abuse of any technique, and especially in a case like that of quantitative analysis, is not one to be taken lightly.

Second, the distinction between criminal and civil adjudication must be given its due. Even if the most carefully prepared statistical evidence and analysis were determined to be improper for deciding a criminal case, it does not necessarily follow that the same is true for civil litigation. As already noted, the goal of accuracy always has had to contend with other factors in the criminal context.[77] The *type* of errors that can be tolerated, and the measure of concern that will be shown for each type of error, are central to questions of criminal procedure.[78] It also is recognized that rules of criminal procedure often are

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> He sought to reconcile the jury to the risk that, under his "new math" approach to criminal jurisprudence, "on some rare occasion . . . an innocent person may be convicted." "Without taking that risk," the prosecution continued, "life would be intolerable . . . because . . . there would be immunity for the Collinses, for people who chose not to be employed to go down and push old ladies down and take their money and be immune because how could we ever be sure they are the ones who did it?"

66 Cal. Rptr. at 505 (ellipses in original).

75. Professor Tribe's work has been particularily influential. *See* Tribe, *supra* note 2, at 1377 (concluding that the benefits of statistical analysis in the trial context are greatly outweighed by the costs). *But see* Finkelstein & Fairley, *A Comment on "Trial by Mathematics,"* 84 HARV. L. REV. 1801 (1971) (answering Professor Tribe's criticism of their statistical method for establishing identity). *See also* Tribe, *A Further Critique of Mathematical Proof*, 84 HARV. L. REV. 1810 (1971) (Tribe's response to Finkelstein's and Fairley's rebuttal of his criticism).

76. 66 Cal. Rptr. at 497.

77. *See supra* text accompanying note 17.

78. *See* Kaplan, *supra* note 17. In Addington v. Texas, 441 U.S. 418 (1979), Chief Justice Burger noted that "[i]n the administration of criminal justice, our society imposes almost the entire risk of error upon itself. This is accomplished by requiring under the due process clause that the state prove the guilt of an accused beyond a

intended to protect interests quite apart from those of either the prosecution or the defendant (e.g., the prohibition against unreasonable searches and seizures). Such rules clearly contemplate sacrifices in the accuracy of trials in favor of other overriding societal goals.[79] The situation is not as clear in civil adjudication. Traditionally, we tend to think of this as a matter strictly between the two parties involved. Upon examination, there may indeed turn out to be values that must be balanced against simple long-run error minimization in the civil context as well. A separate analysis is called for, however, and separate decisions will have to be made.

Finally, these well-known and justifiably criticized uses of "statistics" against criminal defendants should not be allowed to obscure the fact that courts have regularly allowed proper statistical evidence to play a part in civil litigation.[80] Survey evidence, for example, has been found helpful in a large number of contexts,[81] and its further use has been encouraged as "contribut[ing] materially to shortening the trial of the complex case."[82] Statistics also play an ever-increasing role in discrimination cases.[83] Of course, it does not follow from these examples that naked statistical evidence of identification must be given a similarly warm welcome in the courtroom. What we can say, however, is that any suggestion that legal factfinding and quantitative analysis are inherently incompatible simply will not stand up to the evidence.

IV. THE ACADEMIC DEBATE

A. *Professor Cohen and the Case of the Gatecrasher*

The appropriate way to treat explicitly statistical evidence, standing alone and offered as proof of identity in civil litigation, has been called by one leading commentator "a hardy perennial in the law of evidence."[84] As we have seen, however, the question of what to make of such evidence has never been much of a problem for the courts. In civil cases, at least until very recently, such information was rarely encoun-

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reasonable doubt." *Id.* at 423-24 (citation omitted).

79. Compare Chief Justice Burger's comment in *Addington* that the preponderance standard is justified in "the typical civil case involving a monetary dispute between private parties," by the fact that "society has a minimal concern with the outcome of such private suits." 441 U.S. at 423.

80. *See supra* note 1.

81. See authorities cited in Rosado v. Wyman, 322 F. Supp. 1173, 1180-81 (E.D.N.Y.), *aff'd*, 437 F.2d 619 (2d Cir. 1970).

82. MANUAL FOR COMPLEX LITIGATIONS § 2.712 (1982).

83. It has been said, "In establishing the presence of discriminatory or biased treatment the use of statistical evidence is without substitute." Garrett v. R.J. Reynolds Indus., Inc., 81 F.R.D. 25, 32 (M.D.N.C. 1978).

84. Kaye, *Paradoxes, Gedanken Experiments and the Burden of Proof: A Response to Dr. Cohen's Reply*, 1981 ARIZ. ST. L.J. 635, 635.

tered and certainly never seen as anything more than a curiosity that was easily disposed of.[85] Not so in the academic literature. It is in this fertile ground that the problems presented have taken seed and blossomed into a most magical garden. The controversy that surrounds the use of naked statistical evidence takes the form of debate over well-worn hypotheticals suggested by, but only loosely paralleling, cases—and not over the actual cases themselves.

The delightful conundrums posed by these hypotheticals are just the stuff of good socratic dialogue, and most introductory courses in evidence probably pause over them, if only briefly.[86] Scholarly interest in the topic has been heightened in recent years, largely due to the publication of *The Probable and the Provable*[87] by the British author L. Jonathan Cohen. Professor Cohen's work was not the first to consider the subject, but the response that it has elicited has given others the chance to stake out and to crystallize their positions. It is appropriate, therefore, that we start this tour of the academic terrain with his contribution. If for nothing else, Professor Cohen, a philosopher of science at Oxford University, will have to be remembered for introducing us to one more fictitious figure who now enlivens the literature. We have already met Emma, the mule whose fright at low-flying aircraft led to such damage,[88] and Mrs. Smith, the motorist run off the road by a mystery bus.[89] Now enter the gatecrasher at the rodeo.

In his book Cohen introduces this figure (who is never identified beyond the impersonal "*A*") as one of exactly one thousand people known to have been in actual attendance at a rodeo.[90] We are asked to suppose that only 499 people paid for their admission and that "no tickets were issued and there can be no testimony as to whether *A* paid for admission or climbed over the fence."[91] The familiar questions then

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85. Note the even in the DES cases, in which statistical evidence has begun to appear, the courts have not taken this evidence as an opportunity to explore the underlying issues of relevance and proof. *See generally* Mizell v. Eli Lilly & Co., 526 F. Supp. 589 (D.S.C. 1981); Gray v. United States, 445 F. Supp. 337 (S.D. Tex 1978); McCreery v. Eli Lilly & Co., 150 Cal. Rptr. 730 (Ct. App. 1978). The cases typically have been assigned, in the mysterious way legal theory has of compartmentalizing its results, to the field of torts—not evidence.

86. *See, e.g.*, R. LEMPERT & S. SALTZBURG, A MODERN APPROACH TO EVIDENCE 178 (1977). My impression, gathered from talking to teachers of evidence, is that these problems are given only limited treatment in the basic course because of the insecurity most of the professors themselves feel about mathematics, statistics, and anything that looks like an equation.

87. L. COHEN, THE PROBABLE AND THE PROVABLE (1977).

88. *See supra* notes 22-30 and accompanying text.

89. *See supra* notes 33-37 and accompanying text.

90. L. COHEN, *supra* note 87, at 75.

91. *Id.* How can there be no testimony on this point? Can not *A* testify on his own behalf if he wishes? As far as I can tell, this hypothetical springs full-blown from Dr. Cohen's imagination. It seems fair to suggest that this situation was chosen in a

arise when the rodeo organizers bring suit against *A* for the admission price, arguing that by this evidence there is a greater than 0.5 probability that *A* did not pay. The preponderance of the evidence relating to the one critical element of the rodeo organizers case is, therefore, on their side.[92] Are the organizers entitled to a judgment on this evidence alone?

Before we consider Cohen's treatment of this hypothetical and the large body of comment and criticism it has engendered, we must take note of the larger context in which this case and Cohen's arguments are presented. While his book has received a good amount of attention in the legal journals,[93] and while he obviously has become more engrossed in the law as his work has progressed, Cohen's primary interest is not in law or legal theory. His interest in the legal field follows from his attempt to find backing for the grand design of his theoretical work, which resides in the field of formal logic and the philosophical basis of probability theory. The basic thesis of his book is that the concept of probability with which most of us are at least passingly familiar and which has been referred to earlier in this Article,[94] is only *one* coherent and usable theory of probability, not *the* unique philosophical theory entitled to go by that name.[95] Cohen has no quarrel with the idea that the conventional conception of probability—which he variously calls the mathematician's view (to reflect the fact that it allows for manipulation of probabilities by a mathematical calculus), or Pascalian probability (to symbolize its historical roots)—is appropriate and useful in many situations.[96] His argument is that another conception of probability can be put forward that is worthy of consideration, and which after study can be seen to be appropriate and useful in its own right for a class of problems.[97]

In a lengthy portion of his book Cohen develops, by the means of symbolic logic, a system that he terms inductive probability (or Baconian probability to give this system its own historical identity).[98] This

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way to heighten the unreality of and, by implication, to belittle the case made on this evidence. Along this line, I have not been able to determine why Cohen, an Englishman, makes the site of his little drama a rodeo.

92. *Id.*

93. *See* Birmingham, *Remarks on 'Probability' in Law: Mostly, A Casenote and a Book Review*, 12 GA. L. REV. 535, 544-45 (1978). *See also* articles cited *infra* notes 143, 163.

94. *See supra* text accompanying note 11; Brook, *supra* note 5, at 81-82 (The conventional concept of probability rests on certain axioms that allow us to assign numbers as "probabilities" and perform certain meaningful calculations with these assigned numbers.).

95. L. COHEN, *supra* note 87, at 1-4, 46-47.

96. *Id.*

97. *Id.*

98. *Id.* at 121-244.

development in no way depends on or refers to the study of law; its value as a creation in symbolic logic is a matter to be debated by experts in that field. To the reader who comes to Cohen's book because of an interest and background in law, this section may be virtually impenetrable. Certainly the present writer can make no claim to judge the proofs and derivations of Cohen's work from the standpoint of the formal theory of logic. Indeed, a major premise of this Article is that the issue of appropriate legal response to situations such as the one at hand is not a matter to be decided through the dispassionate application of such a formal system. Therefore, there is no point in expecting ourselves to master this type of arcane material. We must take care that the apparent expertise and sophistication which we seem to discern in such material does not lead us to expect answers where none lie. Once Cohen begins to make pronouncements about law, however, his work is appropriately open to comment by those who speak with knowledge and experience in such things.

How then do legal issues become a part of Cohen's overall design? He seizes upon the law as one grand coherent working example of his inductive probabilities in practice. He seeks to develop not only a formal structure with its own internal workings all in order, but also to demonstrate that this newly articulated concept of probability (as distinct from the conventional mathematical notion) has always been present in the real world of experience. Cohen states that: "Even if it were possible to describe, self-consistently, a concept of inductive probability, that concept might nevertheless be unused or unusable in practice. So it is necessary to show at least one important job that a concept of inductive probability can do and any concept of mathematical probability cannot."[99]

The difficulty he encounters is that, in most instances in which individuals might be thought to apply a notion of probability to problems in everyday life, "the framework of discussion seems too loose and indeterminate to provide any secure footing for argument."[100] Cohen finds the needed arena for his arguments, however, in his personal vision of the process of legal decisionmaking:

> [T]here is one field of discussion where an everyday concept of probability is undeniably used within a fairly determinate framework—in British, Australasian, and North American courts of law. Wherever jurymen are instructed to use the same notions of probability and certainty as they use in their more important decisions about their own affairs, we can investigate the working of an everyday concept of probability within a juridical framework that

99. *Id.* at 43.
100. *Id.*

provides some relatively secure footings for argument.[101]

The suggestion that we can examine legal decisionmaking for insight into how people make decisions that are purported to be logical is not a terribly startling one. It is, however, much harder to feel comfortable with the assertion that what we will find when we do make our investigation will give us "secure footings" for *any* conclusions. Cohen views the legal system as a single grand determinate framework for decisionmaking. He perceives the law as being logical, consistent, and generally agreed upon.[102] Anyone who has spent time as a serious student of the law would be justified in questioning whether the view Cohen takes as an accurate description of our legal system really exists at all—other than in the occasional eulogy to a noted jurist, or the commencement address given by a speaker who really knows better.

Cohen's work in general displays a reverence and abiding faith in the law that could only be found in someone who is not a lawyer. He seems to have taken those commencement addresses at face value and has not taken the opportunity to see what legal scholars do when they doff their ceremonial robes and get down to the serious business of analyzing and criticizing the legal rules of their day. Legal scholarship would be a dry business indeed, or perhaps out of business altogether, if the "existing legal standards and procedures"[103] were really as static, consistent, and uncontroversial as Cohen continuously assumes they are.[104]

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101. *Id.* at 43-44. We will have reason to question, of course, how secure these footings are in reality. Once Cohen is able to prove to his own satisfaction that it is his "inductive probability" that is at work in the courts of law, he uses a kind of reverse bootstrap argument to prove even more.

> Moreover, since the triers of facts in these courts are often lay juries who are officially urged to assess the evidence in much the same way as they would assess evidence about such issues in their everyday lives, it follows that the concept of inductive probability is assumed by the Anglo-American legal system to be in widespread everyday use. So, unless the treatment of proof in that system is founded on a colossal mistake, we all constantly employ the concept of inductive probability in reasoning about what has probably, or certainly, happened in a particular situation.

Id. at 345-46.

102. "The relevant legal doctrine is scarcely obscure or in dispute. Purely legal controversies about burden of proof, admissibility of evidence, causal responsibility, etc., need not concern us." *Id.* at 56. If such "purely legal" controversies need not concern us, it is unclear what does. More curious still is the fact that when various legal authorities writing in response to his work find themselves in disagreement over how we should treat situations like that of the gatecrasher, Cohen somehow takes the fact of this disagreement as *supportive* of his position. Cohen, *Letter to the Editor*, 1980 CRIM. L. REV. 747, 752.

103. *See* L. COHEN, *supra* note 87, at 118.

104. *Id.* at 119-20. Even as established an idea as that of the preponderance standard is not without its element of controversy. *See* Brook, *supra* note 5; Tyree,

The fact that Cohen accepts the law in a way that few others would or could is more than just a matter of personal taste. It is a difficulty that undercuts his entire argument. Although the way he discusses particular legal issues may make it difficult, his reader must keep in mind that he is claiming his discussion of the law is descriptive and not normative. His basic thesis necessitates his giving an accurate account of the legal system as it actually exists. This becomes the data that he seeks to explain by his theory and for which he claims to have developed a model better than those that were previously put forward.[105] The accuracy of his account is, therefore, all important. How well he has succeeded is something that can be considered as we turn to Cohen's contribution to the naked statistical evidence controversy.

Cohen builds his case against the mathematicist interpretation of what he sees as the "juridical concept of probability, so often and so confidently employed,"[106] by presenting a set of paradoxes that he claims must follow if that interpretation is adopted. It is in one of these paradoxes that the accused gatecrasher makes his appearance. Recall that this character, *A*, was one of exactly one thousand people known to have been present at a rodeo and it is also established that only 499 of these people paid for their admission. The others snuck in wrongfully and, if they could be identified, would be legally liable to the rodeo sponsors.[107]

The paradox that Cohen sees in this situation, given the adoption of the traditional mathematicist view of judicial probability and the preponderance standard, rests on two assertions. First, he assumes that the rodeo organizers logically would be entitled to a judgment on these facts alone as filtered through the mathematicist's view of probability.[108] Second, he asserts that under existing legal norms the law would not give judgment to plaintiff in such a case as this.[109] And there we see the paradox. Legal rules, if given the mathematicist's interpretation, definitely require a result and that result is not given. Unfortunately for Cohen, both of these assertions are open to question.

The first part of Cohen's claim, that a literal and consistent reading of the civil law preponderance standard in traditional probabilistic terms inevitably leads to a judgment for the rodeo sponsors, can be attacked on several grounds. Contributions in the legal literature, both before and in response to Cohen's work, have offered a number of reasons that are perfectly consistent with classical probability theory to demonstrate that the situation is much more complicated than Cohen

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supra note 9.

105. L. COHEN, *supra* note 87, at 116-20.

106. *Id.* at 51.

107. *Id.* at 75.

108. *Id.*

109. *Id.*

presents it. Simply dividing 501 by 1000 is only the first step in a more lengthy calculation, if calculation is what we want. These arguments will be the subject of the following section of this Article.[110] For the moment, let us consider the second prong of Cohen's argument: that the law, as now constituted in its particular wisdom and in following its own identifiable brand of probabilistic thinking, simply would not allow claims such as those against *A* to succeed. On statements such as this we are entitled to make our own evaluations of the accuracy of Cohen's descriptive account.

How well does Cohen represent the current state of the law on the question presented by his gatecrasher hypothetical? As I have tried to demonstrate in the previous section,[111] the case law in the area is not of much help. It is far from clear what the court would do if the facts were well presented and, after various complicating factors were thoroughly examined, the quantified evidence still weighed against the defendant. If anything, the response of some courts to the use of market share data in the recent DES cases might indicate a turn towards more favorable treatment of this type of statistical information.[112] Cohen does reproduce a well-known quotation from the Massachusetts case of *Sargent v. Massachusetts Accident Co.*, discussed previously, which advanced the so-called actual belief interpretation of the preponderance standard.[113] What has gone unnoticed is that no statistical evidence was presented in that particular case. Furthermore, the general notion expressed by the court in *Sargent* has been widely rejected by more recent cases as well as by legal scholars.[114] Nevertheless, the failure of his supposedly descriptive analysis to find support in actual case law probably would not bother Cohen. He claims to be offering "an account of the *de jure*, not the *de facto*, situation."[115] By this he seems to mean that he is not attempting to describe the outcomes of actual cases, in the style of the legal realists, but rather the broad outlines of judicial proof as they reveal themselves in the most general statements of definition and doctrine available—which statements are just the kind of pronouncements that drive serious students of the law to distraction by their vagueness and, in many instances, by their virtual meaninglessness.

In the end, Cohen's support for his claim of what the law does with cases of naked statistical evidence amounts to no more than the

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110. *See infra* text accompanying notes 142-57.

111. *See supra* text accompanying notes 21-83.

112. *See supra* text accompanying notes 57-68. Also see the discussion of Kaminsky v. Hertz Corp., 288 N.W.2d 426 (Mich. Ct. App. 1979), *supra* note 55.

113. *See supra* text accompanying notes 37-42.

114. *See* Brook, *supra* note 5, at 89-96; Eggleston, *The Probability Debate*, 1980 CRIM. L. REV. 678, 680-81.

115. L. COHEN, *supra* note 87, at 118.

fact that for him it is obvious. He believes it is inescapably true that a court would not, under present law, rule against *A*. This belief is based on another, yet more curious, line of argument. Under the circumstances, Cohen asserts, only one possible result (that is ruling in *A*'s favor) would be just and, hence, is the only possible result that could exist within a system devoted to handing out justice.[116] In reality this is a two step argument, of which we will have to consider each phase. Note that each of the two claims being made is apparently a descriptive and not a normative statement. First, the judgment for *A* is the only obvious just result that can be imagined; and second, the legal system does not admit to rules from which it can be expected that unjust results may flow. In examining these arguments keep in mind that, however we may choose to define the word unjust, it is clear that Cohen takes it to be appropriately applied to any case in which there is a mistaken decision. Thus, for him any instance in which a party loses a case on a factual determination that, had all the facts been known, would have gone the other way, is an instance of injustice.[117] Cohen's use of the word in this way, once he is clear about it, need not trouble us. What is difficult to accept, however, is the descriptive statement—which is what his argument boils down to—that the law neither officially recognizes nor accepts the possibility that such an injustice could result from the work of the courts.

Now let us examine this argument in detail. Cohen simply states, and then repeats over and over again,[118] the conclusion that for *A* to be held liable on this evidence would be so manifestly unjust that the law just should not allow it.[119] The support he gives for this assertion is hardly compelling. Cohen states that "our intuitions of justice revolt against the idea that the plaintiff should be awarded judgment on such grounds."[120] In response, we might be excused for first quoting Cohen himself in an earlier portion of his book:

> Intuition has no more important a function in philosophy than it has in science. In both it may suggest hypotheses to investigate, but in neither is it an oracle of theoretical truth. An expression of the view that such-or-such a principle is intuitively evident, or counterintuitive, as the case may be, sometimes belongs in a thinker's autobiog-

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116. *See id.* at 74-76.

117. *See id.* Professor Williams agrees with this use of the term. Williams, *A Short Rejoinder*, 1980 CRIM. L. REV. 103, 104 n.1.

118. Professor Cohen is quick to respond to any criticism of his work in print. Thus, this argument on manifest injustice is repeated in Cohen, *The Logic of Proof*, 1980 CRIM. L. REV. 91, 96-97; Cohen, *Subjective Probability and the Paradox of the Gatecrasher*, 1981 ARIZ. ST. L.J. 627, 627-28.

119. L. COHEN, *supra* note 87, at 75.

120. Cohen, *Subjective Probability and the Paradox of the Gatecrasher*, 1981 ARIZ. ST. L.J. 627, 627.

> raphy, but never deserves a place in the publication of his arguments for or against that principle.[121]

Even if we are more willing than Cohen to entertain arguments based on intuition, or some still undefined natural sense of justice, we must recognize that, in the case of the gatecrasher, intuition apparently has not led all minds to the same inescapable conclusion. As we will see in the following sections of this Article, various eminent commentators (none of whom displays any obvious disinterest in the principle of justice or lack of intuitive power) have responded to Cohen's gatecrasher case, reaching widely divergent conclusions.[122] This hypothetical, and others like it, pose difficult questions about what the appropriate legal response should be: that is what all the controversy and the writing is about.[123] Cohen's thesis that intuition by itself leads to one obvious, just solution is simply not supported by experience.

Cohen's argument moves from his assumption of what is intuitively just to the further claim that this must be the state of the law simply because it is the just solution. Remember that Cohen does not claim to be making normative statements, nor does it appear that he is making any kind of natural law argument. He claims to be a positivist, merely offering up the data as he finds it. Here again, however, we see his seemingly inexhaustable admiration for the law leading him to find in it a majesty and level of perfectability that not even the most enthusiastic commencement speaker would hope to get by his or her audience. The system of legal rules that Cohen feels himself duty bound to describe is not only a grand engine of logical and consistent thought, but is capable of arriving at its results without the uncomfortable need to acknowledge the possibility of errors, even in difficult cases!

Cohen begins by considering the preponderance of the evidence standard as it has been interpreted through use of traditional probability theory.

> Suppose the threshold of proof in civil cases were judicially interpreted as being at the level of a mathematical probability of .501. Would not judges thereby imply acceptance of a system in which the mathematical probability that the unsuccessful litigant deserved to succeed might sometimes be as high as .499? This hardly seems the right spirit in which to administer justice.[124]

All the mathematicist would say to this criticism is that to rule otherwise would be to accept the possibility of a *greater* number of errors.

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121. L. COHEN, *supra* note 87, at 45.

122. *See infra* text accompanying notes 162-75.

123. It can be inferred from the great variety of results that have greeted the DES plaintiffs in the courts and commentary that there apparently is no one intuitively just result in those cases.

124. L. COHEN, *supra* note 87, at 75.

Also, it must be emphasized that under this decision rule we are not saying there will be 499 erroneous decisions out of every one thousand rendered, but only that there will be up to that many. Most cases probably will not be that close. What we must accept with the rule of 0.501 is that tough cases are tough, and that the possibility of making a mistake in deciding them is real and is greater than we would like.

Cohen's problem does not lie in the choice of 0.501 as being too low. Even if the threshold were as high as a mathematical probability of 0.8, he continues, "this still seems to represent a scandalously high level of admissible doubt for a legal system to endorse *de jure*."[125] But what is the scandal here? Cohen thinks that to properly describe the Anglo-American legal system he must account for the fact that in its choice of rules it officially countenances *no* measure of injustice.[126] This does have a nice ring to it—until we recall the fact that what Cohen means by injustice is any verdict against a party based on a mistaken factual determination. He has argued that a view of the law as officially and de jure recognizing a large probability of error is one of extraordinary cynicism.[127] This seems, however, to turn the whole argument on its head. It would be far more cynical to pretend that the law is better at deciding cases and is freer from the possibility of error than we have any right to expect.[128]

More important is the central fact that, contrary to Cohen's assertions, the law *does* recognize, officially and de jure, that the possibility of mistakes is an inevitable consequence of the court's function of decisionmaking under conditions of less than perfect information. True, no court announces an individual verdict in probabilistic terms; a decision is not announced as against one party with a 0.3 likelihood of error. There is no doubt, however, that courts recognize that they are operating under certain constraints of reality. In a series of recent cases, the United States Supreme Court has analyzed difficult questions of burdens of proof by invoking determinations of "how the risk of error should be distributed between the litigants."[129] This emphasizes the

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125. *Id.* at 76-77.

126. *Id.* at 270.

127. Cohen, *The Logic of Proof*, 1980 CRIM. L. REV. 91, 98.

128. Professor Williams has stated that:

> The probability of injustice is inseparable from human justice. Whenever the trier of fact begins by being in a state of wobble, but eventually decides for one party or the other, he realizes that there is an appreciable possibility of his decision being wrong. The possibility does not go away because you invent a new language for describing legal proof. On this issue it is not the law but Mr. Cohen who is the ostrich.

Williams, *supra* note 117, at 104.

129. Santosky v. Kramer, 455 U.S. 745, 755 (1982); *see* Addington v. Texas, 441 U.S. 418, 423 (1979); *In re* Winship, 397 U.S. 358, 370-72 (1970) (Harlan, J., concurring).

fact that matters of legal proof are concerned not only with the fact that errors may occur, but also the fact that errors (injustices as Cohen would call them) can be borne by either party. This aspect of the law is not picked up by Cohen's description. In fact it is expressly denied. Cohen states: "The plaintiff may win by a greater or lesser margin, but if he wins on all the facts in court the defendant just loses."[130] In a later writing defending his work, Cohen expands on this curious notion, suggesting that only the plaintiff's case is being judged by the court and that a verdict implies nothing about the defendant's contentions.[131] Comments such as these confirm for us how far Cohen's purported description has taken us from the law as we have always thought it to be. Concern about both parties' cases, and about the possibility of error running against either of the sides to a dispute, would seem to be a necessary part of even the most primitive description or model of our factfinding system. This concern flows from the very nature of the adversary process, the preponderance requirement, and a commitment to equal justice under the law.

Later in his book, Cohen muddies the waters still further when he tries to detail what is wrong with the case against *A*, the accused gatecrasher.[132] He seems to be asserting that there is no case whatsoever against *A* under current legal standards because the facts that the rodeo organizers have brought in against *A* do not constitute legally relevant evidence.[133] In a subsequent writing, Cohen explains that this is because the fact of sitting on the seats is not causally associated with nonpayment.[134] The set of figures produced by the plaintiff "tells us nothing about the defendant in the court but is merely an accidentally accumulated statistical property of a temporary social grouping to which the defendant (for perhaps idiosyncratic reasons of his own) happens to belong."[135] Exactly what he means by this is not at all clear. If the evidence presented and the truth of the situation must have a causal association, is it that one is supposed to have caused the other or that both were caused by a common agent? But what does causation have to do with it in the first place? Purely as a matter of description, Cohen's attempt to present the concept of relevance in evidence is as misguided as are other portions of his work as they bear upon the law. The Federal Rules of Evidence, for example, deem relevant evidence to be "evidence having any tendency to make the existence of any fact

130. L. COHEN, *supra* note 87, at 270.

131. Cohen, *supra* note 127, at 99. Even if the defendant offers no evidence at trial, he is making his contentions through his defensive pleadings. What the pleadings say is important to the dispute. The outcome is in some way a judgment on them.

132. L. COHEN, *supra* note 87, at 271.

133. *Id.*

134. Cohen, *supra* note 127, at 97.

135. Cohen, *supra* note 102, at 749 (footnote omitted).

that is of consequence to the determination of the action more probable or less probable than it would be without the evidence."[136] The Advisory Committee's note on this rule stresses the probabilistic nature of this definition.[137] Nothing is made here of an element of causality or of whether the offered evidence was "accidental." Nor does common understanding suggest that those factors are necessarily appropriate to issues of relevancy. We get helpful evidence wherever we can find it. Suppose, for example, in the case of the gatecrasher, that the rodeo organizers happen to find and produce a witness who just happened to be taking home movies in the vicinity of the rodeo entrance on the day in question. Because he was panning around the area and only taking pictures for a part of the time, the fact that his film does not capture *A* entering and paying his admission—and in fact does not show *A* at all—by itself means nothing. Suppose, however, that careful examination of the film reveals 499 *other* people actually turning over their admission fees. Surely this would be considered relevant evidence against *A*, along with the rodeo organizers' accounting of their total receipts. Yet it is hard to conceive of any causal link between this person's filming, or the other rodeo-goers' paying, and anything that *A* did or did not do. Furthermore, the evidence seems about as accidental as you can get. The evidence against *A* is there, but there is no causal link between it and the occurrence in dispute.

In spite of all these problems, it may well be that, for many readers, Cohen's comments on the relevancy of the purely statistical evidence against *A* have a great appeal that cannot easily be dispelled. I have found that many people, including those well versed in legal theory and whose opinions I would not want to quickly dismiss as unthinking or illogical, react in much the same way to cases like those against the accused gatecrasher or the Blue Bus Company.[138] There is for many a strong feeling that finding against any defendant on such evidence alone is somehow improper. Many believe that the case marshalled against a defendant must involve him specifically in a way that these cases do not. Cohen expresses his thoughts along this line as follows:

> It bears hard on an individual like the non-gate-crasher at the rodeo if he has to lose his own particular suit in order to maintain a stochastic probability of success for the system as a whole. . . . Each individual has a right to his day in court, when his interests are touched by the possibility of litigation; and the task of the court in an adversary, as distinct from an inquisitorial, system is to deal out

136. FED. R. EVID. 401.
137. *Id.* advisory committee note.
138. *See, e.g., infra* text accompanying notes 167-68.

> justice between the contending parties in each suit that comes before it.[139]

Cohen's problem is not that he finds within himself this longing to believe that legal decisionmaking is interested in more than merely long-run accuracy. As already indicated, many thoughtful people appear to share this view and this concern. It will become apparent throughout the remainder of this Article that the question of whether the factfinding process can and should live up to these greater expectations is at the heart of what the statistical evidence controversy is all about.

Cohen's failing is in his claim to have solved this quandry by the application of formal logic and by formal logic alone. The obvious expertise in this field that his book displays, as well as the esoteric nature of the material, may cause those schooled only in the law to react to it with more deference than it deserves, and to take from it a false sense of security, just as Cohen seems to place more trust in statements about the legal field than we know to be warranted. Certainly, students of the law should seek to learn from the knowledge and methods of other disciplines. It would be our failing, however, if we sloughed off our own responsibilities and pretended to find definitive answers to difficult questions in other realms in which, as we ought to know, no such answer could lie.

There is no one correct result in the gatecrasher case that is dictated by the cold dispassionate rules of symbolic logic. Any logical system presupposes a set of axioms that cannot be, and need not be, proved. In the legal context, it is these axioms, the underlying values that the system of forensic proof is expected to pursue and which form the basis for our choice of procedural rules, that ultimately will be the grounds on which the gatecrasher and others of his ilk win or lose. In addition, it is on these fundamental axioms that Cohen has nothing to say. If minimization of errors simply in terms of reducing the total number of wrong results is to be the only fundamental criterion of successful factfinding in civil litigation, then traditional probability theory, properly applied and understood, points us to the right result, however harsh it may sometimes seem.[140] There is, however, nothing illogical in abandoning this as the sole unswerving axiom of our system.[141] What is necessary in law, as well as in formal logic, is that all axioms be carefully set forth and their priorities established.

Cohen has discovered and developed a logical system that inexora-

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139. L. COHEN, *supra* note 87, at 120.

140. *See* Mellor, Book Review, The Times Literary Supplement (London), June 23, 1978, at 708 (reviewing L. COHEN, *supra* note 87).

141. Clearly we abandon sole reliance on this criterion in favor of others in the criminal context and in those unusual civil cases in which the clear and convincing evidence standard is applied.

bly leads to a finding of "no case" against the accused gatecrasher. The basis for his system comes down, however, to no more than conformance to "natural intuitions of justice." Given this as a premise, it is no wonder that his system produces a result of which he is proud and confident. As we have seen, however, the just solution to the case is far from being a given. Whether the gatecrasher should be held liable is the very question to be discussed and debated. The true paradox of the gatecrasher, as Cohen presents it, is why anyone would think the answer easy or obvious to begin with.

B. *Some Simpler Explanations*

Consideration of Professor Cohen's efforts highlights the possibility that the success of a legal order in dealing with cases such as those against the Blue Bus Company and the hapless gatecrasher may have to be judged in terms of presently undefined and unexplored goals—in addition to the goal of simple accuracy. Still, the goal of projected accuracy is not one to be taken lightly. In the end, we may come back to it as the sole or predominate criterion. The reader by this point may feel pushed to accept the conclusion that if accuracy is taken as the sole legitimate criterion of decisionmaking in civil litigation, then the case on naked statistical evidence must be conceded to be a good one. Nevertheless, this conclusion may not sit well. Even if long-term accuracy is taken as the exclusive axiom of our system of forensic proof, a case built solely on gross statistics is in many instances unsettling. It is hard to shake the idea that such arguments are somehow defective.

Fortunately, we do not have to condemn ourselves for illogical unlawyerlike reasoning, or for misunderstanding probability theory, to explain our unease with these hypotheticals. In fact, the theory of probability itself—traditional probability, not the new creation of Dr. Cohen—will serve to give substance and form to our objections. Even if the preponderance standard is given the most carefully refined probability interpretation and even if accurate application of the standard over the long run is taken as the one goal set above all others, it can be shown that reasons exist which may justify a finding against the plaintiff whose case relies on statistics alone. While these arguments did not originate with him,[142] Professor David Kaye has laid them out most fully in a recent response to Cohen's paradox of the gatecrasher.[143] Kaye's work shows that a probabilistic analysis of such situations is not necessarily inconsistent with our intuitive distrust of cases relying solely on statistical evidence. We will see, however, that while this clarification does much to brush away the seeming paradoxes, it

142. *See* Tribe, *supra* note 2, at 1349.

143. *See* Kaye, *supra* note 84; Kaye, *The Paradox of the Gatecrasher and Other Stories*, 1979 ARIZ. ST. L.J. 101.

will not eliminate the problem altogether. Further analysis can indeed explain many cases to our satisfaction. In doing so, it narrows the field to a smaller set of hard cases that still must be dealt with.[144]

The further analysis starts with the recognition that, when naked statistical evidence is presented at trial, the most telling feature about such attempted proof might well be its very "nakedness." The fact that no other evidence is being offered—for example, of the origin of the particular bus involved in the accident, or of *A*'s sneaking around the rodeo entrance—is in itself significant. If the situation is such that we could reasonably expect the plaintiff to have other, more traditional types of evidence if his factual contentions are indeed correct, then his failure to bring such other evidence into the courtroom understandably adds to our doubt that the facts are actually as the plaintiff would have us believe.[145] This is plain common sense. It can be good decision theory and good law as well. These arguments regarding the lack of other evidence are in no way antagonistic to a probabilistic interpretation or analysis of legal evidence and the burden of proof. In fact, the methods of probability, particularly the application of Bayes' Theorem to analyze the cumulative effect of additional evidence on ultimate belief, have been used to model this effect.[146] The lack of certain evidence of the type that we would expect to find in the situation like the one before us is in and of itself information that reasonably can be, and presumably often is, important to the determination of the factual issues at trial.[147]

So, for example, in the now familiar Blue Bus Company hypothetical, the fact that eighty percent of all buses traveling the particular route were owned by the defendant company would not necessarily translate into a probability of 0.8 that it was defendant's bus that injured Mrs. Smith. If it appeared that Mrs. Smith had the opportunity to collect and present much more evidence about the bus that hit her—for instance, the markings she saw on the bus, an eyewitness account of a bystander, or even material culled from an examination of the bus company's records and its drivers—the very fact that she did not present additional evidence would legitimately color our perception of her case. It might even lead to a conclusion that it probably *was not*

144. Professor Kaye clearly recognizes that the further analysis does not eliminate the problem altogether. Kaye, *supra* note 84, at 636 n.7. Another recently published article of his attempts to deal with the remaining cases of justified naked statistical evidence. Kaye, *supra* note 4.

145. *See* Brook, *supra* note 5, at 98-100.

146. *See id.* at 99-100 nn.57-58.

147. In everyday life we experience the same effect. Imagine what you would think if you asked a friend whether he passed a test and all he said was: "Most people passed."

the defendant's bus that was involved.[148]

This argument, based on the absence of more particularized evidence, can be very persuasive. It can explain to a great degree the uneasiness we feel with many arguments based solely on background statistical evidence. Indeed, it probably explains why such evidence has not made its way into the actual cases. The skillful trial attorney would quickly recognize how much his or her case would be weakened, and how much distrust might be created in the mind of the factfinder, by presenting a case that curiously seemed to ignore the better evidence that should have been available. This is not necessarily because the factfinder is naive about the nature of statistics or confused about how to use them. It may be only that the factfinder will intuitively do a good job of incorporating (albeit roughly) all available information into his or her perception of the situation.

As important as this argument and explanation is, it does not altogether eliminate the difficult problems with which we are concerned. For one thing, we quickly realize that the evidence's relative inability to influence our decisions, which is caused by the lack of more particularized evidence, is in no way dependent on the fact that the evidence which *has* been introduced is statistical and nonparticularized in nature. The situation and analysis would be no different if the only evidence offered by a plaintiff was the testimony of a single eyewitness. If the accident took place at a busy intersection, why did the plaintiff not produce two or three witnesses who were there? The argument resulting from the lack of other relevant evidence reminds us that *all* evidence will be, and should be, taken by a jury with "a grain of salt." Skepticism is entirely appropriate. The context in which evidence is received naturally affects our evaluation of it. Recognition of this fact alone, however, cannot justify a distinct legal attitude or a set of rules governing the introduction and weighing of purely statistical evidence.

Reflection upon the accident at the crowded intersection leads us to a second point. The problem of why the plaintiff would present only a single eyewitness, instead of a whole troop, often has a simple and reasonable explanation. The plaintiff's need is not to present the most thorough and exhaustive proof imaginable. All that she needs is enough to convince the jury under the appropriate standard. Once she has produced some relevant evidence, it may then be up to the defendant to bring forward more information if the factual issue is to be considered a serious one at trial. If the defendant wants to make an argument based on the plaintiff's failure to bring more than a single eyewitness,

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148. In terms of probability theory, what this would mean is that while the *a priori* probability of its being a blue bus was 0.8, the *a posteriori* probability that it was, given the fact that no other evidence was offered by plaintiff, was lower than 0.5. *See* Brook, *supra* note 5, at 99-100 nn.57-58.

he would be more likely to produce other eyewitnesses to testify for his side, rather than simply harping on the plaintiff's failure to present others. A party's decision to limit the amount of evidence produced at trial often will be due to an attempt to keep litigation costs at a manageable level. Beyond this, the party probably is aware of the legal doctrine that looks with disfavor upon trial tactics judged to constitute "undue delay, waste of time, or needless presentation of cumulative evidence."[149]

It is not suggested that the counsel representing our friend Mrs. Smith should rest comfortably after presenting the statistical evidence and no more. Counsel should investigate the incident as thoroughly as is reasonably possible (bearing in mind, of course, the costs of this investigation to the client) and hope to present far more evidence to the jury. This author would suggest, however, that when making an academic argument involving the incentives to produce more evidence, or evidence of any particular kind, the factors involved are more complex than is often acknowledged. It often has been stated without comment that naked statistical evidence always should be treated as insufficient to meet a plaintiff's burden of proof, in order to create "an incentive for plaintiffs to do more than establish the background statistics."[150] Such a statement, however, merely begs the question. Why do we want more than background statistics in the first place? Giving the plaintiff's presentation of such evidence the appropriate amount of weight would create a reasonable and healthy incentive for the defendant, who might be in a far better position to gather relevant particularized evidence, to rebut the plaintiff's nonparticularized evidence.

A third point that should be stressed in considering this argument concerning the lack of other, more traditional evidence is that it has obvious limits, and these limits will be a function of the facts in any particular case. The failure of the plaintiff to produce evidence other than statistical evidence may legitimately give us reason to estimate the probability of plaintiff's factual contention's being true at some figure lower than the statistical evidence standing alone would justify. There is no reason, however, to think that this revised probability estimate would necessarily be zero, or even be below 0.5 in any given case. As in any trial situation, the particular facts are important. The appropriate result must take the facts into account. If, for example, Mrs. Smith could establish that at least ninety-five percent of all buses on the specified route are owned by the defendant company, but she proves no more, this fact may under the circumstances give us pause. But it would not necessarily be true that we could, or should, take from this

149. FED. R. EVID. 403.

150. Tribe, *supra* note 2, at 1349. This idea is picked up in Kaye, *supra* note 15, at 610.

that it probably was *not* one of defendant's buses that caused Mrs. Smith's injuries.

Even when other particularized evidence is offered at trial to counter the weight of the statistical evidence, there is no reason under standard decision theory to hold that the thrust of the statistical evidence has by this fact alone been effectively neutralized. Suppose Mrs. Smith does offer evidence that ninety-five percent of all buses on the specified route are the defendant's buses, and suppose further that the bus company counters with a single eyewitness who testifies that he saw the bus involved and that it was not a blue bus. Unless we believe that this eyewitness is infallible, or very nearly so, it may still be far more likely that plaintiff's version of the accident is correct. The simple fact that there are many more blue buses on the road to begin with may lead one to believe that it is far more likely that the particular bus in question was a blue bus, which was mistakenly identified by the eyewitness.[151] In this situation, it may be that a court would direct a verdict

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151. A numerical example may be of help. Suppose, as in the text, that 95% of all buses in town are owned by the defendant Blue Bus Company. The other 5% are owned by a competitor, the Grey Bus Company. Further suppose that the defendant's eyewitness, who swears the bus he saw was a grey bus, is overall 80% accurate. By this we mean that 80% of the time a bus passes him he correctly recognizes it and later recalls its markings. (This is probably a generous estimate.) Let:

B = it actually was a blue bus involved
G = it actually was a grey bus involved
b = the witness testifies it was a blue bus
g = the witness testifies it was a grey bus

From the facts as given, we can state that the *a priori* probability, the likelihood any given passing bus is one or the other before we consider any particular evidence on that point, is given by:

$$P(B) = .95$$
$$P(G) = .05$$

We also have assumed the following conditional probabilities, regarding the accuracy of our eyewitness;

$P(b/B) = P(g/G) = 0.8$ (the probability he will get it right);
$P(g/B) = P(b/G) = 0.2$ (the probability he will get it wrong).

We now want to establish the *a posteriori* probability that the bus was a blue bus *given that* the witness testifies it was a grey bus. That is P(B/g). Using one of the accepted forms of Bayes' Theorem,

$$P(B/g) = \frac{P(g/B) \times P(B)}{(P(g/G) \times P(G)) + (P(g/B) \times P(B))}$$

$$= \frac{(.2)\ (.95)}{[(.8)\ (.05) + (.2)\ (.95)]}$$

$$= .826$$

for the defendant. It may even be that after careful consideration this is a result that we can endorse. If this is true, however, our conclusion will have to be founded on some value we wish to advance other than simple accuracy of results. If accurate decisionmaking is to serve as our guide, it must be acknowledged that no one *kind* of evidence is naturally endowed with the power to trump all other evidence of a distinct *kind*.[152] In their potential ability to convince or explain, all types of evidence are equal.[153]

Even with all these qualifications, there is a good chance that the unease we have with the use of naked statistical evidence can be explained by taking into account the plaintiff's failure to provide other evidence when such other evidence would seem to be readily available. In fact, it seems to be a consistent feature of the hypotheticals offered in this debate to cry out for comment along this line. Any attempt to tighten up these minor pieces of fiction, for instance by asking the reader to assume that there is absolutely no way for Mrs. Smith to find

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So while the eyewitness' testimony does make it less likely than was first thought that a blue bus was involved, it is still far more likely that it was a blue bus than that it was not. This same result, and the powerful impact of the initial background statistical evidence we started with, is easier to appreciate if we look at similar calculations on a simple chart:

	The bus actually was	
	blue	grey
Witness testifies the bus was blue	152	2
Witness testifies the bus was grey	38	8
	190	10

Consequently, of the 46 instances when the witness testifies he saw a grey bus, the bus was actually blue 38 of those times and he was correct only 8 times. It is blue 38 out of 46 times or 82.6% of the time, still far more than 50%. *See* Saks & Kidd, *Human Information Processing and Adjudication: Trial By Heuristics*, 15 LAW & SOC'Y REV. 123, 130 n.9 (1980-81).

It is unfortunate how easy it is for people discussing this controversy and creating their own hypotheticals to forget that other kinds of evidence have their own problems and nonzero error rates. *See, e.g.*, Tyree, *supra* note 9, at 97-98. He concludes that there would be no error at all if everyone who had purchased a ticket in the rodeo example comes to the trial with "a friend who is willing to give evidence." *Id.*

152. The initial likelihood of a statement's being true continues to affect our response to the statement. We intuitively respond to these statements most easily at the extremes. If an eyewitness tells us a particular cow at the side of the road was brown, we tend to believe it easily. If the same person tells us a second cow was a purple cow, we tend to think this is one of the few times that he is mistaken. The rationale is that it is more likely that a report of a purple cow is mistaken than a report of a brown cow. In their article, Professors Saks and Kidd explored the human tendency to ignore the value of background evidence in many situations when the cases are not so extreme. Saks & Kidd, *supra* note 151, at 129-30.

153. *See* Brook, *supra* note 5, at 100 n.61.

out anything more about the Blue Bus Company, serves only to remind us of just how rare the use of justified naked statistical evidence, the truly hard case, will presumably be. It even has been asserted by one commentator that "there is no case—and I mean *no* case—in which the only evidence is gross statistical conclusions."[154] But experience proves differently. It is, in fact, interesting that the situation which comes closest to being a pure form of the hard case of justifiable naked statistical evidence is not a hypothetical designed and labored over by scholars in the course of their debates. Rather, it is the actual situation that has given rise to the DES litigation.[155] In these cases, the central question involves the identification of the particular manufacturer responsible for the drug taken by the plaintiff's mother. This drug often was taken decades before the trial and well before any concern about the drug's safety became known. In a number of cases plaintiffs have been able to offer conventional evidence on this issue.[156] In other cases there is no conventional evidence available; therefore, the only proof the plaintiff can offer is market share information. It is very difficult to argue that, under these circumstances, the plaintiff's failure to present any additional information identifying the particular manufacturer involved is a lack of more particularized evidence that will have a significant bearing on the probative value of plaintiff's statistical evidence.[157] Consequently, the need to confront the hard case remains. It remains not because of our considerable ability to twist and bend hypotheticals to our purposes, but because the real world serves up situations as devilish as any we could devise.

C. *Two Views of the "Hard Case"*

We are left finally with the need to consider the hard case, the case that will not go away even under the most careful scrutiny. How are we to deal with the situation created by a plaintiff's exclusive reliance on statistical evidence to prove identity when this reliance is perfectly understandable, or when the negative inferences taken from the plaintiff's failure to produce other evidence weakens his case but not to

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154. Winter, *The Jury and the Risk of Nonpersuasion*, 5 LAW & SOC'Y REV. 335, 339 (1971).

155. *See supra* text accompanying notes 56-68.

156. *See supra* note 63. An interesting point is that, assuming the plaintiff in such a case sued the manufacturer of only around 15 to 20% of the market, and assuming that the evidence offered, for example, the recollection of plaintiff's mother or a druggist, had some nonnegligible likelihood of error, it would remain more probable than not that the particular defendant's drug was *not* involved. It would be more likely that the plaintiff's evidence mistakenly, albeit honestly, identified the wrong manufacturer. This result can be shown to follow from an analysis similar to that shown above in note 151.

157. *See supra* text accompanying note 64.

the point of falling below the preponderance of the evidence standard?[158] There is academic comment and debate on this point. What is striking about it, however, is that the participants usually content themselves with taking a stand on the issue, and then allow the reader to appreciate the self-evident virtues of any assertions made. The positions taken may differ in the extreme, but the level of debate is not of the highest.

Recall the work of Professor Cohen, and in particular his hypothetical about the gatecrasher at the rodeo.[159] It is apparent that Cohen believes that he has shown that a case built on such evidence must fail. He relies on the manifest injustice of any other result, and his case boils down to the assertion that "our intuitions of justice revolt against the idea that the plaintiff should be awarded judgment on such grounds."[160] Intuitions of justice, however, are not as uniform as Cohen would have us believe.[161] Support for this criticism is found in the responses to Cohen's work and in particular his rodeo hypothetical.

Now consider the responses of two writers, each a leading academic lawyer in his own country, to the gatecrasher hypothetical. Both of these writers, Professor Glanville Williams, a leading British scholar, and Sir Richard Eggleston, Chancellor of Australia's Monash University[162] were quick to react to Professor Cohen's book.[163] Each was highly critical of Cohen's approach, and this author has made use of their

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158. The controversy usually is characterized as coming about because of a plaintiff's attempt to make a case by statistical evidence. A case that may arise more often in actual litigation would be one in which the defendant attempts to counter plaintiff's more conventional identification evidence with its own evidence of how limited its market share is. If plaintiff produced an eyewitness to testify that the defendant's product was involved, the defendant would want to offer market share information to counter this evidence. It would appear that many if not most judges would probably find the statistical evidence to be irrelevant once an eyewitness had been produced; but this is not the case. *See supra* notes 151-52.

159. *See supra* text accompanying note 91.

160. *See* Cohen, *supra* note 120, at 627; *see also supra* text accompanying notes 117-27. Professor Kaye has demonstrated that, unless we are willing to make the gatecrasher hypothetical even more fantastic than it already is, we can respond to it in a much simpler way than having to accept it as an irreducible example of the hard case. *See supra* text accompanying notes 143-54. Cohen and two authors whose opinions will be discussed below seem willing to treat the gatecrasher hypothetical as the hard case and, therefore, place the controversy in a particular unreal arena. The hard case, however, is more appropriately represented—and more realistically approached—by the facts of the DES litigation.

161. *See supra* text accompanying notes 117-27.

162. Professor Eggleston is also an author of a book on probability and evidence. R. EGGLESTON, EVIDENCE PROOF AND PROBABILITY (1978).

163. Eggleston, *The Probability Debate*, 1980 CRIM. L. REV. 678; Williams, *The Mathematics of Proof—I*, 1979 CRIM. L. REV. 297; Williams, *The Mathematics of Proof—II*, 1979 CRIM. L. REV. 340; Williams, *A Short Rejoinder*, 1980 CRIM. L. REV. 103.

comments in his own work. What is interesting, however, is the breadth of Williams' and Eggleston's disagreement as to the appropriate attitude that courts should take to the use of naked statistical evidence. A comparison of these two critiques of Cohen's work reveals that their positions may well serve to establish the extreme poles within which the debate must play itself out.

Professor Eggleston's position clearly represents acceptance of the use of naked statistical evidence along with the consequences of its use.[164] He argues that, once this evidence has been carefully collected and refined, its full probative weight cannot be denied. The justification for this approach, as discussed above,[165] is that it is the position most in accord with the goal of minimization of errors.

> [I]f one accepts that the figures postulated make it more probable than not that a person chosen at random from the group of spectators did not pay, I do not see why that evidence would not be admissible, and being admitted, make a prima facie case. . . . [T]he injustice which troubles Mr. Cohen, of giving judgment against a man whose case has a probability of 0.499 of being true, exists in every case in which the plaintiff makes a prima facie case on the balance of probability, and the defendant, for one reason or another, is unable to rebut it. It does not outweigh the injustice of refusing a remedy in those cases in which the plaintiff has the odds in his favour.[166]

Professor Eggleston would play the odds. His straightforward rationale is, in effect, that he can offer no better way to proceed given the uncertainty inherent in decisionmaking.

Professor Williams takes a contrary view. He does not quibble with the mathematical analysis, but does disagree with the suggestion that it can, or should, mandate a particular legal result. Even if only fifty of the one thousand rodeo spectators paid for their seats, he asserts that "[i]t would still be wrong to give judgment against *A*."[167] In a subsequent article, part of his continuing debate with Professor Cohen, Williams extends this reasoning to the case when only *one* out of the thousand paid the admission price, so that we confront "the overwhelming probability (0.999)" that defendant *A* did not pay.[168]

Since Williams does not deny the inferential force of such overwhelming probability statements, he must find support for his position denying liability in some other realm. He acknowledges this, stating: "The reason why the case is not made out against A must therefore lie elsewhere than in the rule as to the quantum of proof."[169] Commenting

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164. *See generally* R. EGGLESTON, *supra* note 162; Eggleston, *supra* note 163.
165. *See supra* text accompanying notes 14-16.
166. Eggleston, *supra* note 163, at 681-82 (footnote omitted).
167. Williams, *The Mathematics of Proof—I*, 1979 CRIM. L. REV. 297, 304.
168. Williams, *A Short Rejoinder*, 1980 CRIM. L. REV. 103, 105.
169. Williams, *supra* note 167, at 304.

on the whole dilemma of naked statistical evidence, Williams postulates a requirement of legal factfinding and proof that goes far beyond anything inherent in, or suggested by, the preponderance standard. He states:

> Evidently, statistics cannot make good a deficiency of evidence involving the particular defendant. The true reason why the proof fails in the gatecrasher case and not the Blue Bus case is that it does not sufficiently mark out the defendant from others. No doubt, we are illogical in this. . . . Our sense of justice requires evidence to be given singling out the defendant from other possible culprits. This requirement that evidence should focus on the defendant must be taken to be a rule of law relating to proof, distinct from the general rule governing quantum of proof.[170]

Professor Williams favors this result, while at the same time branding it as illogical![171] Perhaps he is too hard on us and on himself. We should be reminded, however, that there is nothing inherently illogical in setting up a particular set of criteria for factfinding, as long as those criteria are consistent with the goals of the factfinding process. It is not illogical to insist on evidence that focuses on a particular defendant—assuming that phrase can be given true content—provided that this insistence is not being made in the name of accuracy or as part of a system that claims to have long-run error minimization as its overriding concern. If not the minimization of total errors, what goals would justify supplementing the preponderance standard with this additional evidentiary requirement?

Williams states that, if a case relying solely on statistical evidence fails, "as it should, . . . [t]he reason lies in the unacceptability of holding that a person is liable merely because he happens to be chosen as a defendant, or merely because he is the largest operator in the field."[172] He finds this situation unacceptable,[173] and many might agree with him, but in truth Williams offers us no explanation of where this unacceptability lies. Is it anything more than a gut response? To suggest that it is a gut response and no more is not, of course, to say that it is a response that can be ignored. It does call, however, for further explanation and testing. Why, for example, is it not equally unacceptable to find against a defendant merely because one eyewitness places him or her at the scene of the accident? Eyewitness accounts definitely leave open the possibility of error, but their use to decide questions of fact is not disputed.[174] Might not the acceptability of evidence change over

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170. *Id.* at 305. *See* Williams, *supra* note 168, at 105-06. This approach is criticized in Eggleston, *supra* note 163, at 681.

171. *See* Williams, *supra* note 167, at 106.

172. Williams, *supra* note 168, at 106.

173. *Id.*

174. *See* Brook, *supra* note 5, at 105 n.71.

time? Once it might have seemed unthinkable to convict a criminal defendant merely because his fingerprints matched smudges found at the scene of the crime; nevertheless, the use of such means of proof is commonplace today. Williams clearly believes that the preponderance of the evidence standard is accompanied by another independent criterion in the civil trial process.[175] This additional standard is a requirement concerning the *kind* of proof the winning party must bring forth, not how much or how influential it must be. His comments, however, serve only as an introduction. Exactly what this new and independent criterion amounts to—and what justification can be marshalled for its inclusion in a decisionmaking process that is already quite difficult and complex—are matters still to be explored.

V. A Particular Requirement

The distinct requirement of legal factfinding that Professor Williams postulates is that evidence, regardless of its inferential strength, must somehow focus on the defendant if it is to be sufficient. This requirement is a theme that runs throughout the discussion of this topic.[176] In my discussions with others about these cases and hypotheticals, I find it a point that many insist on, although they are not necessarily able to explain why. What is the source of this requirement? Why, other than to merely satisfy some innate feeling in those who happen to discuss these matters or who choose to write about them, should we require particularized evidence to be offered by any successful litigant?

Before we even can consider such questions, we should acknowledge that the very suggestion that there is a distinct brand of evidence, that which is particular to the defendant or that focuses on him, is fraught with difficulties. Most people probably believe that they know it when they see it. I might even be able to spot it myself. Do we know, however, what it is we are seeing? Does fingerprint identification focus on the defendant because it refers to *his* fingers in particular, or is it merely a matter of statistics? Is it not true that the fingerprint is said to refer to a particular person because of statistics which indicate that there is a low probability of finding more than one person with a certain combination of these markings? Is it particular enough under the new criterion if Mrs. Smith, in her suit against the Blue Bus Company, were to prove that every bus in town other than those owned by the defendant company was at someplace other than the scene of the accident at the time the accident occurred? I leave to those who support

175. Williams, *supra* note 167, at 305.

176. In particular we see it in the work of Professor Cohen, who tries to deal with it in a highly "technical" way, and in the work of Professor Tribe, who sees it as evidence that these issues cannot be resolved by getting too technical.

this requirement the difficult task of laying it out in detail. The present question is whether any such requirement is necessary or desirable. If it is determined that this is a necessary requirement, it should be for identifiable reasons. These reasons will in turn inform our decision about how to give greater precision to what is now only a vague desire for something more than naked statistical evidence.

What is the impetus for this desire for something more than statistics? In some cases it is no doubt the legitimate concern that statistics by themselves do not tell all of the story.[177] The very fact that plaintiff relies solely on background statistics, and fails to provide any other particularized proof, can itself be powerful evidence that causes us to lower our estimate of the validity of the plaintiff's factual claim. In this respect, the call for particularized evidence would be nothing new. It is not a function of any requirement that it meet some distinct qualitative criterion, but only a particular application of our general factfinding procedures—based on the desire for accuracy of results—that calls for all relevant evidence being considered and given due weight. As noted previously in the discussion of this aspect of the problem, this inference from the lack of other evidence—which could be evidence of any kind, as long as it was the type we would expect to find in the case—is of great importance. But it does not answer all cases. To the extent that those arguing for particularized evidence extend their claim even to the hard case of justifiable naked statistical evidence,[178] their call needs other justifications.

It may be that some people call for further evidence in the hard case because they simply do not believe the argument that statistical evidence is as relevant and probative as it actually is. They seem to think that the goal of accuracy is hindered, not furthered, by its use.[179] Some people apparently are not willing to admit that numbers can help to tell a story.[180] There will be doubt about the story as it is told, but

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177. *See supra* text accompanying notes 142-50.

178. Clearly this is the case for Professors Williams and Cohen. Their arguments do not even bother to explore the simpler analysis based on lack of other evidence that should be available. Professor Tribe's position is unclear. His article clearly acknowledges that the lack of other evidence, absent satisfactory explanation for its absence, can explain much of our difficulty with the use of statistical evidence alone. He continues, however, to say that "absent satisfactory explanation, there are compelling reasons of policy to *treat* the subjective probability as less than .5—or simply as insufficient to support a verdict for plaintiff." Tribe, *supra* note 2, at 1349. The emphasis is in the original, but what does it mean exactly? "Absent satisfactory explanation," as he puts it, of this being the only evidence offered, there is no need necessarily to "treat" the subjective probability as anything other than what it would be. Most often it would actually be under 0.5 and there would be no need to treat it as anything else. Tribe seems to be saying here that even *given* a satisfactory explanation for the lack of other proof, the law should never treat this kind of evidence as enough. *See id.* at 1341 n.37.

179. *See, e.g.*, Jaffee, *supra* note 2, at 458.

180. *See, e.g., id.* Jaffee states: "It is *always* illogical, procedurally irrational,

this doubt exists with all evidence. There is little reason to give credence to an argument that is based on a lack of understanding of the basic principles involved.

Most authors, however, do not seem to be making this mistake. They acknowledge the inferential value of statistical evidence. Certainly Professor Williams is sensitive to the argument in favor of relying on the numbers.[181] Yet he still would rule the other way. To hold this position, he must acknowledge from the start that the admirable pursuit of accuracy cannot be carried out with single-minded dedication. Some competing and independent goal of judicial factfinding must be identified in order to justify, at least to some extent, the sacrifice of our accuracy objective. Some legitimate concern about the factfinding process as a *means* of decisionmaking, must be discussed along with our regard for the *ends* that process achieves.

In answer to this call, an argument which reminds us that each trial of an individual's rights is also a public event has gained much attention. How a court goes about resolving an individual case, what evidence it allows to play a part, and how it deals with that evidence, will have a slight but real effect on the public's respect and attitude toward the judicial system as a whole. We must be concerned not only with whether the trial process does its job well in its own terms, or in terms of formal scientific decision theory, but also that it does a good job in the eyes of the community that it serves.

No one is arguing that the result in every case should be put to a public referendum. At the same time, however, we cannot ignore the fact that public acceptance of the basic ways in which the judicial system functions, and the community's understanding of, and respect for, the rules of the game as it perceives them, is itself a matter of concern in the long run. In a well-known article, Professor Tribe advances this approach, stressing what he terms the ritual aspect of trial that is to be given weight along with the unquestionable value of precision of factfinding.[182] He is undoubtedly correct in asking us to consider this part of the larger picture, but as this author has argued elsewhere, what effect this consideration will have on our eventual choice of proper legal form may be trickier than Tribe acknowledges.[183] It certainly does not make the determination of a case built on purely statis-

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and unfair to allow any party to use probabilistic or statistical evidence as direct, independent, primary proof upon an issue of affirmative, ultimate, actual (existential or parametric) fact with respect to which the party has the burden of persuasion." *Id.* at 458 (emphasis in original). *Cf.* Ellman & Kaye, *Probablistic Proof: Can HLA and Blood Group Testing Prove Paternity?*, 54 N.Y.U.L. REV. 1131, 1161 (1979) (test results should be admitted; however, the means of presentation should be restricted).

181. *See supra* text accompanying notes 167-72.

182. Tribe, *supra* note 2, at 1376-77.

183. *See* Brook, *supra* note 5, at 102-05.

tical evidence as easy as he seems to suggest.[184]

Tribe in effect argues that because it is clear to him that there is something wrong with a system which allows a defendant to be held liable merely because some numbers are not in his favor, this attitude also must be true of the public at large.[185] He concludes that the system would suffer greatly in the eyes of the public if it allowed such a case to succeed.[186] To a large extent the value of this type of criticism is a matter for empirical investigation. Ideally we would want to know by some measure of public opinion how the problem appears to the person on the street. Up to now we have only guesses.

The following section of this Article will speculate further on this point.[187] For the moment, let me suggest that even the question of what community opinion would show if we chose to survey it is not clear-cut. I grant that public support might not be found for the case against the alleged gatecrasher. At the same time, however, it would not be surprising to find a very different perception of the DES litigation.[188] It is not hard to believe that we would find public doubt about a system that would *withhold* recovery merely because the injured woman is unable to produce just the right kind of evidence concerning some medication that her mother took decades before. In the end, I can make no more claims than anyone else regarding what the public really thinks. I do suggest that the answers are far from obvious and furthermore, that what the public response is may well depend on the nature of the case itself.

Even if we could ascertain with some degree of confidence the public perception of such cases, it is clear that this would not settle the question of the proper legal rule. Assume for the sake of argument that public opinion is resoundingly against finding for the plaintiff on purely statistical evidence in any situation, that there is no doubt that the community finds this unacceptable. The question remains as to *why* the public holds this opinion. It may be based on a widely held, albeit mistaken belief that reliance on nonparticularized evidence would produce all wrong results, or at least far more wrong results than right ones. This would be a very different situation from discovering that the public, while it recognizes the inferential value of statistical evidence, and while it has a great regard for the accuracy objective of legal factfinding, does not hold accuracy to be the only objective. The public may see the use of statistical evidence to prove identification in civil litigation as being in conflict with other legitimate goals that it expects its legal institutions to further.

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184. *Id.*
185. Tribe, *supra* note 2, at 1372-75.
186. *Id.*
187. *See infra* text accompanying notes 199-223.
188. *See supra* text accompanying notes 57-68.

Assume not only that we actually could canvas public opinion regarding these questions, but also that our survey could effectively discriminate between the two distinct situations described above. If the public's distrust of the use of statistical evidence to prove identity is only a reflection of a pervasive misunderstanding of the power of evidence expressed in quantitative terms, is there any reason to be influenced by the public's distrust in fashioning the rule of law?

There may be many techniques of identification used at trial, even used against a *criminal* defendant, that do not find instant acceptance or even recognition in the community. For example, the results of a sophisticated process such as neutron activation analysis will be admissible in a criminal prosecution when it is shown that the technique has "gained general acceptance *in the particular field in which it belongs*."[189] Other cases speak of general acceptance *in the scientific community*.[190] Public appreciation of techniques like neutron activation analysis appears to have nothing to do with their admissibility as evidence. If anything, I expect that the public has a better comprehension of and respect for statistical data, judging from the public's general inclination to play the odds often encountered in everyday life, than it has for neutron activation analysis. It is necessary, of course, that any scientific technique and the permissible inferences that may be drawn from its use be explained to the trier of fact. If this were our only problem, we could ask for experts on probability theory and statistics to testify to the jury.[191]

A second point to be raised is that a public misunderstanding of statistically expressed information, while understandable in a world plagued by "math anxiety," need not be taken as invariable. If some new technique would increase the accuracy of the trial process, there must be a heavy burden on the legal system, and particularly on the scholarly interpreters of that system, to educate the public concerning the desirability of its use. We can acknowledge that factfinding at trial

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189. Frye v. United States, 293 F. 1013, 1014 (D.C. Cir. 1923) (emphasis added) (systolic blood pressure deception test held inadmissible).

190. United States v. Brown, 557 F.2d 541, 556 (6th Cir. 1977). *See* United States v. Tranowski, 659 F.2d 750 (7th Cir. 1981); United States v. Franks, 511 F.2d 25, 33 n.12 (6th Cir. 1975); United States v. Stifel, 433 F.2d 431 (6th Cir. 1970).

191. For those opposed to the use of any mathematical techniques at trial, this suggestion only makes things worse, raising the spectre of juries being unduly impressed by expert testimony. In particular this is a concern of Professor Tribe. Tribe, *supra* note 2, at 1361-65. The situation as Tribe explores it tends to center on the implications of allowing the prosecution in a criminal case to use such evidence. *Id.* The "ritual" aspects of trial become the traditional protections that due process affords the criminal defendant. These are not concerns of this Article, which deals only with the civil suit. One wonders, however, if the possibility of an expert being too convincing would be as troubling if the expert and his scientific evidence were being used on behalf of the criminal defendant?

takes place in a larger social context, and that society's quirks and flaws cannot be ignored in judging trial procedures, without relinquishing our responsibility to educate and influence public opinion for the better.[192]

The harder situation must now be considered. How should we react to an argument that the case built on justifiable naked statistical evidence must be rejected because public opinion holds it unacceptable, not because of a misunderstanding or confusion about the probative force of such evidence, but because it is used for some independent reason thought to be distasteful or destructive to the legal system or society as a whole? This is a harder case with which to deal, but the difficulty it entails is one that rightfully must be laid at the doorstep of those who make the claim. They have the obligation of presenting a more detailed discussion of exactly what societal interests and values are being called into play. On what basis would they have us reject an approach that offers, in the long run, to minimize errors? In favor of what goals would they have us proceed? It surely is not enough to simply assert that the public finds some result unacceptable. This is no more convincing or instructive than a much easier to believe statement that the particular writer or speaker finds the possibility unacceptable. The response to such claims must depend on the reason why the speaker, or the community, reacts the way it does.

Certainly there are numerous other examples of evidentiary and procedural rules that find justification not in the desire for accurate decisionmaking, but in other competing goals. These goals are most noticeable in criminal procedure, but they are present in civil procedure as well. It usually is true that the goals or societal interests that bring these rules into being are relatively clear. They may be carefully articulated or merely presumed to be obvious. They may be easy to accept or highly controversial. They are there, however, for our inspection. Upon consideration, and depending upon the beliefs about the relative interests involved and the likely effect of the procedures upon these interests, we may commend, reject, or modify the rules as found. The goals or societal interests that weigh in favor of requiring particularized evidence, however, are far from clear.

Rules may be designed that sacrifice accuracy, but they should do so for a reason. The values being advanced may relate not simply to the image projected by the trial process, but to concerns of society as a whole. Thus, rules of criminal procedure that limit the use of improperly seized evidence find support in the legitimate interest of assuring all members of the community that their persons, houses, papers, and effects will remain secure from unreasonable government intrusion.[193]

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192. *See* Brook, *supra* note 5, at 105.
193. *See* U.S. CONST. amend. IV.

Excluding certain privileged communications from use at trial springs from a belief, whether justified or not, that this is beneficial to the maintenance of these valued associations, such as those between spouses, doctor and patient, and so on.

Other goals may be more directly related to the trial process. The privilege against self-incrimination[194] stems in part from a desire to protect citizens from being subjected to certain types of treatment by the government if this protection were not in place. It also may reflect the fact that society does not countenance the sight of a man being convicted on his own words. Some vague but important principle of respect for individual integrity, and the loss that is experienced by the community as a whole when its officials violate this principle, may be at work. Suppose, for a moment, that a drug were discovered that rendered one unable to tell a lie. Could we then demand that each trial witness be injected with this drug? Our quest for accuracy seemingly would demand it. Other values would make the problem more difficult. Actual physicial interference with the person of another is not to be taken lightly.[195]

Arguments based on the recognition of society's interest in protecting the value of personal integrity, however defined or expressed, must be handled carefully. It will not suffice in the case of naked statistical evidence simply to argue that it fails because its failure to focus on the defendant does not take his personhood into account. As already noted, it is entirely conceivable that a case could be built against a particular defendant, not by any testimony linking him directly to the incident, but by competent evidence effectively eliminating all other possible malefactors.[196] A case built on cumulative circumstantial evidence succeeds not because any one witness personally confronts the defendant with an accusation of what he has done, but because the totality of the information available points to one inference from the facts, one preferred interpretation of what happened. There is no general requirement in civil litigation that each defendant be presented with an accusor who is willing to link him with the alleged wrongdoing in any particular way.[197]

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194. *See* U.S. CONST. amend. V.

195. Under state or municipal law, however, we often require school children to get innoculations before they can attend school. Balances must continually be struck.

196. *See supra* text accompanying notes 65-68.

197. I admit that it is tempting to ask that every defendant, even in a civil case, be confronted by at least one person willing to take the stand and point the accusing finger at him. But this desire may relate more to a sense of drama than a sense of justice. It must be recognized that such an incident has the power to mislead as well as inform. In an earlier time, when trials by ordeal and combat were still accepted techniques, it must have been very comforting to see the defendant singled out in a clear way by the most authoritative witness imaginable. But with increased understanding (and after a large number of poor fighters have been condemned on this fact alone) we

A second point may be even more important. A civil trial involves the rights, duties and future happiness of the plaintiff as much as it does the defendant. As claims and counterclaims fly, the determination of who is the plaintiff and who is the defendant often depends solely on who chose to bring suit first. If there is a legitimate claim to respect for personal integrity, it must be one on which both the plaintiff and the defendant can draw. Is there any better way to recognize and pay respect to this value than by treating all mistaken conclusions as equally undesirable, whether they do damage to the personal fortunes of the defendant or those of the plaintiff? The argument in favor of the use of justifiable naked statistical evidence in the name of error minimization rests, after all, not on some belief in accuracy for its own sake or on a mindless desire that the law be modern or scientific. It is a concern about errors, and a concern for the individuals who will bear the brunt of these unfortunate errors, that leads us to do what we can to avoid as many errors as we are able.[198]

VI. How Cases May Differ

One difficulty that has prevented a full discussion of the naked statistical evidence controversy is that it is usually dealt with as an all or nothing proposition. You are either for it or against it. While the discussion may begin with an initial hypothetical situation complete with facts and figures, commentators resolve the problem for themselves with blanket assertions apparently meant to cover all cases. This can be seen, for example, in the differing views of Eggleston and Williams noted earlier. While each is initially reacting to the gatecrasher hypothetical, how he resolves the hypothetical can be seen as standing for a much broader proposition. Eggleston would have us treat a case built solely on background statistics no differently than any other. He believes that, even if after careful consideration and testing the statistics weighing in plaintiff's favor are only marginally above 0.5, the plaintiff deserves to win.[199] For Williams no case can be made on statistics alone. A judgment for a plaintiff is always unacceptable if no particularized evidence has been offered against the defendant.[200]

Yet cases do differ. If nothing else we know that we react very differently to them. Hypotheticals and cases submitted to decisionmaking analysis may reduce to the same formal paradigm, but they may simply refuse to so merge in our minds. Relying on statistical evidence and probability analysis may seem clearly wrong and unacceptable in one case, while in a parallel case it seems altogether proper. Whether

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lose the right to find comfort in such things. *See* Brook, *supra* note 5, at 104-05.

198. *See id.* at 86 n.20.

199. *See supra* text accompanying note 166.

200. *See supra* text accompanying notes 167-73.

we conclude that our different perceptions of, and reactions to, each individual case gives justification for treating them differently under the law, we cannot ignore the fact that these differing reactions occur. We should try to learn from them.

It should be emphasized that in what follows I am making no assertion as to what any particular person's reactions should be. People differ just as the cases do. I am assuming only what seems to be true from my discussions with many others about these cases and from observing my own reactions. The assumption is that for most people the cases are not all of a piece. The measure of determination, or at least temptation, to make use of the statistical evidence presented ranges along a spectrum. Each reader is invited to explore his or her own responses to the various situations, real and imaginary, when numerical evidence alone is said to tell a story. One should ask: What factors affect our willingness to listen to that story as it is told? What factors rightfully should have that effect?

The initial impetus that caused me to look at these cases in this way resulted from an interesting phenomenon. The phenomenon comes to light when the DES litigation[201] is lined up alongside the classic hypotheticals of the blue bus and the gatecrasher. Not everyone reacts in the same way, but very often one pattern emerges. People who see nothing of value in the plaintiffs' cases in the hypotheticals are at the same time receptive to, if not in total agreement with, allowing the DES plaintiff to collect. Certainly not all are of the same opinion. After deliberation, some decide that they would not allow the DES plaintiff to collect when all she could provide of proof of identity was market share data. But for almost everyone the decision is at least acknowledged to be a difficult one; the plaintiff's claim is not easily dismissed as being of no value—or as mathematical sophistry—as are the hypotheticals.

The reception that DES market share data offered to overcome identification problems has received in the courts has not been uniform. Some courts have flatly rejected its use to prove identity when no other evidence is presented.[202] In one important case, however, the California Supreme Court allowed judgment in favor of the plaintiff on the basis of market share information alone, even though all the manufacturers who had been responsible for manufacturing DES were not before the court as defendants.[203] In *Sindell v. Abbott Laboratories*, the court held that the plaintiff could recover if the manufacturers responsible for a *substantial percentage* of the market of DES to which her mother

201. *See supra* text accompanying notes 57-68.

202. *See supra* note 66.

203. Sindell v. Abbott Laboratories, 607 P.2d 924 (Cal.), *cert. denied*, 449 U.S. 912 (1980).

had been exposed were joined as defendants.[204] Each defendant then would be held liable for the portion of the judgment corresponding to its market share at the time that the drug was sold, unless it could prove that it could not possibly have made the DES responsible for the plaintiff's injury.[205] The result has a great deal of appeal and may be followed by other jurisdictions.[206] The aim of this Article, however, is not to review the DES litigation or the reasoning and impact of the *Sindell* decision. Our concern is with the DES situation as it has presented itself in the large number of cases, and with the basic idea that stands behind market share liability. It can be argued that it is the same basic idea behind any plaintiff's case based solely on statistical evidence. Yet here it seems to be packaged in a way that makes it far more appealing and more likely to be deemed acceptable than when it is packaged in the conventional hypotheticals. Cases are indeed different, but what is different about the DES cases that may account for our different reaction to them?[207]

One way cases may differ is by the actual numbers involved. Professor Cohen's gatecrasher hypothetical with an initial probability of

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204. *Id.* at 937. The court did not identify exactly what minimum percentage was required. It wrote: "we hold only that a substantial percentage is required." *Id.*

205. *Id.* What is left unclear by the majority opinion is whether the total judgment awarded the plaintiff will be equal to the amount that she would be entitled to if 100% of the DES manufacturers were joined as defendants or will be reduced to reflect the fact that not all manufacturers are before the court. For example, if the plaintiff sues a group representing 80% of the relevant market, do they share responsibility for paying for her full loss or do they pay 80% of what would constitute a full judgment? The court's intended result, that its decision would require the various manufacturers to pay only their pro rata share of the harm caused by the drug, would seem to suggest that the latter is what was intended. *Id.* at 938. Indeed, at least one court has gone beyond *Sindell*, and explicitly held that DES defendants, if they proved their market shares, could avoid being liable for any percentage of plaintiff's recovery that exceeded the total of those market shares. Martin v. Abbott Labs., 689 P.2d 368 (Wash. 1984) (En Banc).

Other aspects of the *Sindell* opinion, however, make sense only if interpreted to mean that the defendants bear all the loss. The court stated that the joined defendants may in turn cross-complain against other DES manufacturers and bring them into the case. *Sindell*, 607 P.2d at 937. This would be of no value to the defendants if all it did was raise the total judgment that the group of defendants would have to pay. Also, what is the purpose of the *substantial percentage* requirement if each defendant will be held liable for its percentage of the market without regard to the exact pool it has been thrown into? Why not allow the plaintiff to sue the maker of 20% of the drug alone as long as she recognizes she will receive only 20% of her loss? *See* Note, Sindell v. Abbott Laboratories: *Is Market Share Liability the Best Remedy to the DES Controversy?*, 18 CAL. W.L. REV. 143, 163 (1982). On this last point, it may be that notions of judicial economy are at work.

206. *See supra* note 68.

207. The reader does not have to agree with the ultimate result in *Sindell* of course; however, he or she is invited to examine his or her reactions to the use of statistical evidence in such a situation.

0.501, just slightly over the magic 0.5 figure, seems calculated to bring forth disapproval. For some people the case's whole complexion alters when the figures are changed so that 900 out of the 1000, or 990, or 999 persons have not paid. It can be easily appreciated why this might be so. When the background figure on which the plaintiff relies is only marginally above 0.5, the possibility is strong that our ultimate subjective probability estimate of the defendant's being correctly identified actually will be below 0.5. This follows from taking into account the fact that the plaintiff has offered no more than the background statistics when more evidence might be easily available.[208] In addition, there is concern that the correct background statistics may not be before us.[209] A little difference can mean a lot. On the other hand, if the initial statistic presented is very high (e.g., 0.99), these same complicating factors are present, but it is far less likely that their overall effect will be to reduce the ultimate subjective probability estimate of the plaintiff's being correct to below the 0.5 figure.

While a difference in the numbers may explain much, it is clear it cannot explain all. First, some people will not accept the case against the gatecrasher no matter how close to unity the probability figure may be.[210] Beyond that, it seems that even when the same figures are put in different settings they do not necessarily elicit the same response. Apparently, as a matter of tradition, the blue bus hypothetical is usually presented with the information that eighty percent of the buses going down the particular route are owned by the defendant. While opinions differ, many people believe this plaintiff has not made her case, nor is her case attractive at any level. Many of these same people, however, are very favorably disposed to the DES case, even if the defendants make up only eighty percent of the relevant market. The number can be raised in the first case and lowered in the second, yet the reactions may not vary.

Situations that, as a matter of formal decision theory, can be reduced to the same case by our mathematical model are not necessarily seen as identical by every human decisionmaker. Other factors and features that are not accounted for by the model must play a part in explaining at least the initial reactions that many express. These will be factors and features that relate not to the projected accuracy of the ultimate decisions being made, but to something else. This "something else" is acknowledged not to be captured by the model, and hints of its existence must give us pause. But these hints need not be taken as rendering the model or the arguments flowing from it as useless or clearly

208. *See supra* text accompanying notes 142-57.

209. *See infra* text accompanying notes 215-17.

210. This is the position of both Professors Cohen and Williams, whatever else they may disagree on. *See supra* text accompanying notes 127, 167-68.

wrong. As I have already argued, for many people the model seems to be missing something to which they intuitively respond. This fact is not, in and of itself, reason to abandon the model and to fashion a legal rule that has as its main virtue the fact that it allows cases to come out the way we feel they should. By doing so, the goal of accuracy would be intentionally sacrificed in favor of something else yet undefined and unexamined. Intuition may turn out to be a poor teacher. Study of the model, even if grudgingly carried out, can help us avoid distractions that are initially attractive but ultimately unsound. These distractions prevent us from achieving the best that we can from our factfinding process, whatever we might ultimately decide to be the goals of that process.[211]

The advocates for a requirement of particularized evidence have yet to come forward with a convincing explanation of why there should be this requirement. They have not articulated a goal that justifies placing this qualitative burden on the proponent of a proposition in addition to the quantitative requirement of proof by the preponderance of the evidence.[212] Perhaps we can suggest a way of approaching this problem by comparing cases. Some of the cases apparently require this new criterion of necessary proof more than others. We may gain insight into the value or values being intuitively, if dimly, evoked by examining the differences in these cases.

Let us now consider the cases by setting them side by side and looking for differences that may account for our different reactions to them. One obvious aspect of the DES case that may color our reaction to it is the identity of the particular defendants involved. These are large, wealthy, and powerful drug companies. At least we suspect that they are wealthy and powerful. How different they appear than the suspected gatecrasher—he could be you or me—singled out of a crowd, who claims that his only mistake was wanting to take in a rodeo. This sounds like the ultimate case of a little guy getting picked on. In other words, I fear it is likely that a large part of the difference we sense between the two cases may be attributed to the depth of the pockets we assume to be present in each case.[213] The prospect of wrongly making a

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211. The object of scientific decisionmaking as used in any discipline is not, as some seem to think it is in the law, to insure that decisions are made in a cold, heartless manner just so they seem less human. The object is to find the best way to achieve human goals as we set them. The rigorous scientific testing and statistical analysis used by medical research, for example, is an attempt to arrive most securely at results which can be of help. Like everyone else, I want the personal attention of my attending physician. I am annoyed if I feel that I am treated like a machine and not a person. But if my doctor offers me a choice between two treatments, one of which scientific method has shown to be effective, and one of which he has a hunch will work, I would choose the former, not the latter.

212. *See supra* text accompanying notes 176-98.

213. Note that intentionally or inadvertently finding liability more easily because

rich and powerful drug company pay, even for something it did not do, may simply not trouble us as much as wrongfully holding one rodeogoer—Everyman out for a good wholesome time—liable.[214] The two plaintiffs evoke different sympathies as well. Compare the single individual stricken with a truly frightening disease with the entrepreneurs sponsoring the rodeo.

Of course we react differently to different situations and to different people; we are only human. Legal results based on a particular defendant's ability to pay have a certain attraction, but ultimately this feature does not offer a solid and defensible justification for treating some cases based on statistical evidence differently from all the rest. Upon reflection, would we feel comfortable with a rule that requires more than naked statistical evidence if the defendant is not especially wealthy or easily able to pay any judgment that might become due? Having different evidentiary requirements apply to trials when those with deep pockets are being sued does not comport with our underlying assumptions about how factfinding at trial is to proceed. Ultimately we reject any differentiation based on the wealth of the defendant, and for sound reasons. Note, however, that our rejection is not based on any academic theoretician who preaches that a mathematical model of decisionmaking informs us that we must. The result is not compelled by any precepts of mathematics—cold, rigid and unconcerned with human values and foibles—but by our own introspection into human values and the value of treating all defendants equally under the law.

While differences in the defendants' apparent wealth may play a large part in accounting for the differences we initially feel between the various cases, I do not believe that it explains those different reactions entirely. I do not find myself or other people changing their attitudes towards the gatecrasher hypothetical by adding to the facts presented that *A*, the accused, is a very wealthy man. If anything, adding this feature may only make it seem that the plaintiffs are not simply picking on one person at random, but that they have decided to pick on someone just because he can pay. In this case, the deep pocket defendant may only get more of our sympathy. In addition, the blue bus hypothetical does not, in my experience, always get the sympathetic response that the DES cases do. Yet in the blue bus hypothetical the defendant was a bus company, hardly the kind of defendant that cus-

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of the wealth of the defendant is not the same thing as placing liability on the best risk allocator or on the party best able to insure. While this party may often be the powerful or wealthy defendant, there is no reason to think that this will necessarily be so. I am speaking here of a deep pocket theory in its purest and most crass sense.

214. Of course the amount for which the alleged gatecrasher could be held liable, presumably the price of one ticket, would be far less than any judgment a DES manufacturer might have to pay. It might even be a much lower percentage of his total wealth than it would be for the drug company.

tomarily would evoke sympathy for the little guy. The wealth and position of the defendant must play some part in how these cases are seen, but it does not explain them entirely. Even if it did, it would not offer a satisfying justification for treating some cases differently than others.

Another difference between the cases highlighted when we compare the blue bus hypothetical to the DES cases gives us more to think about. In the DES situation, any given defendant, as a manufacturer of a drug later found to be dangerous, has clearly and without question done something wrong. Although we do not know if what the defendant did wrong had any negative repercussions for the particular woman who is now bringing suit, we do know that this manufacturer did put this drug on the market, creating a risk that could have hurt *somebody*, and a somebody very much like the plaintiff. Compare the DES cases to the blue bus hypothetical, in which it remains theoretically possible that the Blue Bus Company has never done anything wrong. It is possible that no blue bus has ever been driven negligently or that the company's business has never resulted in an unreasonably high risk of loss to anyone. The statistical evidence, we are correctly reminded, can never completely negate the possibility that the bus company is totally innocent of any wrongdoing. The DES manufacturer's wrongful conduct is present for all the world to see.

At one level this argument may be nothing more than a reminder that in arguing from background statistics we must be sure to have the correct statistics. In the blue bus hypothetical, we are told that eighty percent of the buses traveling the route are those of the defendant company. But is not the statistic that we are concerned about the percentage of all the buses driven *negligently* on the route which are defendant's?[215] To assume these figures are the same is to read the requirement of proving negligence out of the hypothetical. Strictly speaking this is not true; in any bus accident case, Mrs. Smith's included, negligence must be shown. The hypothetical depends on the fact that the plaintiff has been able to make a showing of negligence by credible evidence.

Still, we are legitimately concerned that a jury or judge might too easily take proof of eighty percent of all buses as equivalent to eighty percent of all negligently driven buses. If the defendant's safe driving record is markedly better than that of other companies, this fact should affect our evaluation of Mrs. Smith's case, not because the defendant deserves some generalized credit for all that it has done for safety's sake, but because this fact correctly lowers the probability that the

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215. This concern is not as great in the DES situation because we assume that all DES was made in the same manner, and that there is strict liability for making it that way. Therefore, the amount of wrongful behavior is directly related to the amount of the company's market share of the drug manufactured.

company's bus was involved in any one accident. This is not to say, however, that Mrs. Smith's attempt to use a grosser statistic, based only on the percentage of buses generally, should be given no consideration. How we treat her evidence may well depend on the actual statistics she comes up with. If her proof is that fifty-one or fifty-two percent of all buses are the defendant's, it seems quite legitimate to refuse to conclude from this fact that the defendant's buses are involved in a majority of all accidents. On the other hand, if ninety percent or ninety-five percent of all buses on the road were blue buses, the likelihood that those buses are not involved in a majority of the accidents would be remote, unless there was evidence that the Blue Bus Company had a vastly better driving record than any other bus company. Remember that to allow Mrs. Smith to go forward on the grosser general statistic of ninety-five percent would not necessarily give her victory as a matter of law. Rather, it would shift the burden to the defendant to show its markedly better safety record. If the defendant's record is not better than any other company's record (which would presumably be true in most situations), we have saved the plaintiff the extra expense of compiling a distinct statistic that would not be much different. If the defendant company's record is that different, we are rightfully putting the burden on the party who is in a much better position to acquire evidence on point.

At a deeper level, the distinction based on known wrongdoing by the defendant might lead to a much more significant rule of procedure and not simply a refinement of the numbers used. For the moment let us postulate a rule that allows a plaintiff to make out a case against a defendant based solely on statistical evidence, if that defendant is known or can be shown to have acted wrongfully in creating a risk of harm to the plaintiff, or at least to some people in the plaintiff's position. The rationale is that we should worry less about naked statistical evidence singling out for punishment a particular party who is in fact innocent of any wrong against the plaintiff if that party is independently shown to be a wrongdoer in general. Errors against wrongdoers may weigh less heavily on our minds. Put bluntly, the idea may seem farfetched, but at least one commentator on the DES litigation suggests something like it. Professor Glen O. Robinson has written:

> [F]airness in the civil context seems to require only that a defendant's liability be related to his conduct, and that liability, where imposed, be roughly proportional to the seriousness of the *risks* that he has created. Despite Cardozo's insistence that liability not be imposed for "negligence in the air," considerations of fairness do not forbid it. From the standpoint of fairness, the critical point is the *creation of a risk* that society deems to be unreasonable, not whether anyone was injured by it.
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> On this premise, imposition of liability in the DES cases is fair. By assumption, each defendant made a "defective" product that cre-

> ated an unreasonable risk of the harm the plaintiff suffered. "Fault" can be imputed to a defendant's conduct from the fact that it made a product that created such a risk. Whether the defendant's actions caused injury in the particular case does not alter the character of its conduct, which was as final as the defendant could make it.[216]

Professor Robinson's reflections on the DES cases run well beyond this one comment, but the idea suggested here is intriguing. Perhaps the whole problem of proving identification of the exact wrongdoer in the particular situation, of establishing some direct causal link between the actions of the defendant and the harm done the particular plaintiff, is of less relevance than we have always thought. At least it appears that way when considering the DES situation.[217]

It is not possible in this Article to explore fully this idea and all of its implications. Within the context that we have developed, however, it is fair to point out that it must be dealt with very gingerly. We are considering the possibility that we could distinguish among cases when similar statistical evidence was being offered and allow its use only when independent evidence establishes conclusively that the defendant was guilty of creating a risk that society deemed to be unreasonable. Are we willing, however, to extend this rule to other instances and find for Mrs. Smith if she is able to establish by proof at trial that blue buses often drive negligently down the streets of the city, even though they may not have hit anyone yet? Does the case against the gatecrasher brought by the rodeo producers look any better if they prove he has been a gatecrasher at other events in the past? Opinions will differ, but for many this makes the case for these hypothetical plaintiffs no more palatable.

The fact that the DES defendants are known to have created an unreasonable risk that *could* have fallen on the person now suing may lessen our unease with the case built solely on statistics, but it does not really explain that initial uneasiness. Why does the same argued distinction—that an erroneous judgment for plaintiff is especially to be avoided when the defendant is quite possibly an entirely blameless party—not come up when other types of evidence are relied upon? It is quite true that naked statistical evidence cannot entirely eliminate the possibility that the Blue Bus Company or the accused gatecrasher was

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216. Robinson, *supra* note 59, at 739-40 (footnotes omitted) (emphasis in original).

217. *Sindell*, of course, did not actually abandon the causal link. First, the court allowed any manufacturer to avoid liability if it could prove that its product could not have been the cause of plaintiff's injuries. The court claimed only to be shifting the burden of proof on the identification issue to the defendant. *Sindell*, 607 P.2d at 937. Second, there is nothing in the case to suggest that a DES plaintiff could not simply ignore market share liability and sue an individual manufacturer, using more traditional evidence to prove identity.

totally innocent of any wrongdoing against this plaintiff or anyone else. Nevertheless, neither can eyewitness evidence, unless we are prepared to assume that the eyewitness is infallible. The possibility that factfinding will result in an error, and that the weight of the error could fall on an entirely blameless individual, is always with us as long as we stand willing to decide cases on less than perfect information. What needs to be repeated, however, is that errors may take their toll on plaintiffs as well as on defendants. In addition, the likelihood of error depends on the probative value of evidence, and not on its type, style, or configuration.

We turn now to two aspects of the DES litigation that may account for the fact that statistical evidence seems more appropriate in that litigation than in the hypothetical cases: First, what influence does the fact that there are multiple defendants have on this situation? Second, what is the effect of our awareness of the large number of potential plaintiffs, each waiting her day in court?

Consider first the fact of multiple defendants. Under the holding of *Sindell* it must be concluded that if one single manufacturer had accounted for eighty percent of the DES market, it could be sued alone and made to pay a substantial judgment.[218] This comes very close to Mrs. Smith's case against the Blue Bus Company, with which many have great trouble. Theoretically, it seems that making a case against five or six manufacturers whose combined market share was eighty percent should be even harder than making a case against a single defendant with a similar eighty percent market share. At least if this portion of the market was itself equally divided, judgment against any one defendant would come in favor of a plaintiff who probably was *not* hurt by that individual defendant's product.[219] Why should one defendant be found liable any more easily because others are named as defendants with him? Practically, the fact of multiple defendants colors our view of the case by allowing us to focus on the fact that no one manufacturer will be held liable for all harm caused by DES, rather than on the fact that each will be liable for some of the harm. The *Sindell* court explained the virtue of its holding by stating that under its rule "each manufacturer's liability for an injury would be approximately equivalent to the damages caused by the DES it manufactured."[220] As others have pointed out in more detail, there is good reason to believe that there will be significant departures from this equivalence.[221] Be-

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218. What remains unclear under *Sindell* is whether this single manufacturer would be liable for a judgment covering plaintiff's total damages or only 80% of this amount. *See supra* note 205.

219. *See* Robinson, *supra* note 59, at 725.

220. 607 P.2d at 938.

221. *See* Kaye, *supra* note 4, at 508-09; Comment, *Refining Market Share Liability*: Sindell v. Abbott Laboratories, 33 STAN. L. REV. 937, 938-42 (1981).

yond such departures, we note that, however good this approximation is, it will not necessarily be better when the defendant is one of several who make up a substantial percentage than when one manufacturer has had the lion's share of the market and is sued alone.[222] How then, if we find favor with *Sindell*, can we deny the case against the single manufacturer who makes eighty percent of the product? If the DES case seems different to us than the blue bus hypothetical, by virtue of the fact that several defendants will share liability as opposed to a single defendant bearing the brunt, the fact of this sharing is only distracting us from seeing the true implications that arise from the use of market share data in the first place.

Perhaps of greater significance than the multiplicity of DES defendants is our awareness of the huge number of DES plaintiffs and potential plaintiffs. The hypotheticals we have considered are each presented as a single isolated case. The DES litigation consists of numerous cases, all involving basically the same situation. If the explanatory power of statistical evidence and probabilistic analysis is correct in what it tells us about the long run of DES decisions, we do not have to engage in a thought experiment to see the long run of DES litigation stretching out before us. We seem to be confronting a body of decisions each of which can be right or wrong, but no one of which is a unique isolated case. While formal decision analysis does not require that a large number of identical cases actually be contemplated, other than that they are to be judged by the same standard of proof, individuals might understandably find the academic arguments much more compelling when the justification for those arguments is being played out right before their eyes.

Considering both the fact of multiple defendants and the fact of multiple plaintiffs, it is not surprising that the DES cases often are viewed as totally unlike the isolated situations presented by the classic hypotheticals. It may be much easier to believe in playing the percentages when one is playing over a long period of time than when one is making that single all or nothing bet. Yet the best bet in the latter case

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222. The blue bus case has been criticized because holding the single defendant liable for the total judgment would amount to making a company responsible for perhaps 80% of all accidents pay as if it had caused 100% of them. Tribe, *supra* note 2, at 1349-50. Thus, the defendant Blue Bus Company would pay approximately 25% more than it should have to pay. If the *Sindell* opinion is read as placing upon the joined defendants the full loss the plaintiff suffered, even though not all manufacturers were joined as defendants, then each of the defendants suffers the same fate. If the substantial percentage of market share that has been joined at trial is 80%, then each individual defendant would pay approximately 125% of the harm its product caused. If under *Sindell* the total judgment is reduced to reflect the total market share represented by the defendant or defendants, then the approximation is presumably much better, but again it is an approximation that is not dependent on whether there were one or several defendants joined.

is no different than the best bet in the former case.[223] Merely because a case like the DES litigation is an easier one in which to intuitively accept the value of using statistical evidence does not mean that it should be the only case in which we allow the use of such evidence. Rather, I hope that those whose first instinct, when confronted with the now familiar crew of fictional characters, was to deny the possibility of a case based on naked statistical evidence will reevaluate this position in light of their appreciation of the value of such evidence in the DES cases.

One final feature of the DES cases is perhaps the most important in understanding our reactions to it. It is simply that the DES cases are just that: real cases and not abstract exercises. I find that, in discussing hypotheticals, most people are very ready and able to consider the injustice done by an erroneous verdict against the defendant—he could be made to pay for something he did not do. For some reason that is not clear, it seems harder to focus on or take into account the injustice or harm that can be done by an erroneous finding against a plaintiff. If a fictitious plaintiff cannot make a case, we seem to be saying, that is the way things sometimes are; sometimes the evidence just is not available. True, but why use this as an explanation for holding against a plaintiff when highly probative evidence *is* available? Perhaps the fictitious plaintiff is a hard person with whom to come to terms. I have never known anyone to be interested in knowing more about the nature of the injuries or the monetary loss suffered by Mrs. Smith in her bus accident. The impact of what has happened to the DES plaintiff, on the other hand, is all too easy to accept. Cancer is a frightening thing to contemplate.

VII. CONCLUSION

Up to now the controversy over the use of statistical evidence of identification in civil litigation has been a battle over a few well-worn hypotheticals. These hypotheticals often seem to have been devised in a way designed to accentuate the unease we have with this type of proof.

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223. Of course I am referring to the best bet here only in the sense of that bet chosen to produce the maximal expected payoff. People's betting behavior does not necessarily conform to this rule nor is there any analytic reason why it must. Anyone who gambles, knowing that the odds are designed to make money for the house, and are, therefore, not in his favor, must be choosing bets on other criteria. Gambling can be entertaining and exciting and there is no reason to think we do not or should not pay for these pleasures. But this is gambling. If we were entrusted with another person's money, then to bet it in this way would be to take our pleasure at the expense of someone else. Normally we would not think it right to do so.

I argue that a jury is, in effect, gambling with someone else's money. Even if they are not literally playing with other people's money, they are entrusted with decisions that affect others' rights and duties. For the jury not to play the odds is for it to sacrifice the expected outcome of those others. On what basis can we say the jury or other factfinder has the right to force this sacrifice on the parties?

Even if this were not so, the very fact that the cases were only hypothetical may have skewed the discussion. It has been made all too easy to dismiss naked statistical evidence proving identity as merely a kind of trickery or gamesmanship. Justification for denying the value of information expressed in numerical form has been found in vague appeals to human values and public acceptability, although these ideas are neither well defined nor fully explored. Yet when a real case appears, and when real plaintiffs with real injuries come to the court with statistical evidence to prove a crucial element of their case, the power and importance of naked statistical evidence becomes most difficult to ignore.