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INEVITABLE ERRORS: THE PREPONDERANCE OF THE EVIDENCE STANDARD IN CIVIL LITIGATION

James Brook*

I. INTRODUCTION

Once a trial has begun, the legal system stands committed to deciding the issues of fact that are crucial to the case being tried. Our society accepts the fact that a verdict must be arrived at even though a significant amount of uncertainty may exist at the time of decision as to the correctness of the verdict. The factfinder is not afforded the option, which might be unavoidably attractive in many cases, of refusing to decide or even of insisting that more or better evidence be brought to his attention if he must settle the disputed facts. In a system in which disputed facts are judged by fallible humans, as opposed to one such as trial by ordeal which calls upon divine guidance, it is acknowledged that, even under the best circumstances, errors will occur. That errors will occur may be inevitable, but it is also exceedingly troubling.

Rules relating to the conduct of trials may be evaluated on the basis of the level of error that may result from their use. The only rule that would ensure the absence of errors at trial would be one that outlawed trials altogether. Otherwise, the choice of rules relating to trial affects and is affected by judgments, conscious or otherwise, regarding the number and types of errors that will flow from the introduction of a particular rule. A second matter of concern is how that level and distribution of errors relates generally to other values in the society.

This Article will consider one particular rule relating to the trial process: The burden of persuasion placed upon litigants in the standard civil trial situation.[1] Generally, in order to prevail, the party with

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1. On the "burden of persuasion" as one of two aspects of what is more generally called the burden of proof, see James, *Burdens of Proof*, 47 VA. L. REV. 51 (1961). The term refers to the

the burden of persuasion must prove his case "by a preponderance of the evidence" offered at trial.[2] What can it mean to say that this is the burden placed upon, for example, the plaintiff? At first glance, this may not seem a particularly tricky question; the standard seems to call for a simple weighing procedure which is no more subtle than the common sense notion expressed in such ideas as majority rule or seeing the better person win. The standard is sometimes thought to be only determinative in that rare situation where the case is a dead heat or tie to the trier of fact.[3]

Whatever common sense may say, the meaning to be given this standard, at least as developed by a number of courts and legal scholars, and what it reveals about how the trial process is to operate is far from simple. After appreciating the complexity of this standard, one may easily understand why a survey of jurors conducted in 1937 revealed that the proposition of law the jurors reported they had most difficulty understanding was the "preponderance of the evidence" standard.[4]

This Article begins by introducing a particular approach to the preponderance standard, a method that makes use of some basic probability theory. Although this model is termed a probability approach, its development involves only the most simple arithmetic and is neither highly theoretical nor abstract. Understanding the model requires no particular mathematical sophistication and the model, in fact, has been adopted by a number of courts with no difficulty.[5] This approach has the virtue of carrying with it a result that serves as its justification since it reduces erroneous verdicts to a minimum. The Article then reviews criticisms of this model and its alternatives which still

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need of the party assigned this burden to convince the factfinder of the truth of his assertion when the question is ultimately placed before the factfinder for determination.

2. McCORMICK'S HANDBOOK OF THE LAW OF EVIDENCE § 339, at 793 (2d ed. 1972) [hereinafter cited as McCORMICK]. This standard may not be applied in every case; for example, where the particular jurisdiction requires proof in a class of cases by a "clear and convincing evidence" standard. *See id.* § 340.

3. *See, e.g.,* Winter, *The Jury and the Risk of Nonpersuasion,* 5 LAW & Soc'Y REV. 335, 339 (1971).

4. Conference Report, *Trial by Jury,* 11 U. CIN. L. REV. 119, 192 n.18 (1937). While the Report did not indicate what instruction these jurors were presented with, it is tempting to surmise that the instruction involved something like the "actual belief in truth" standard, discussed *infra,* notes 29-47 and accompanying text. McCormick's classic treatise, after reviewing the confusion that surrounds the term, concludes that where no pattern jury instruction is available, "trial judges would be wise to search for the locally accepted phraseology and adhere to it religiously." McCORMICK, *supra* note 2, § 339, at 796.

5. *See* McCORMICK, *supra* note 2, cases cited at 794 n.56.

have their adherents. In considering these alternatives, a particular question should be kept in mind: Do they offer convincing reasons for moving away from an approach which claims to offer a chance to minimize errors?

II. A Probability Approach

For present purposes and to keep the discussion manageable, suppose that the resolution of a particular case has come down to a single disputed factual issue, X.[6] In order to win, the plaintiff must satisfy his burden of persuasion that fact X is true. In other words, there must be more evidence tending to show that X is true than evidence against this proposition. The standard is not construed to mean more evidence in a strictly quantitative sense as in the volume of evidence or the number of witnesses who have appeared. Rather, the amount of evidence is a qualitative standard, weighed in terms of its ability to convince. The standard is translated into a requirement that, based on the totality of evidence produced, it appears that X is more likely to be true than false.

Statements made in terms of likelihood lend themselves to explanation and quantification using the theory of probability. The assertion that the probability of a statement being true equals a specific number is meant to be a measurement of the likelihood that it will turn out to be true. The number allotted must be between zero and one; the higher the likelihood, the higher the number. If the probability is given as zero, then the statement is definitely not true. If the probability is given as one, the statement is definitely true. To declare that the statement "X is true" is more likely than "X is false" is only to say that the probability of "X is true" itself being true is greater than that of "X is false" being true. In other words, it may be said that the probability of X, denoted $P(X)$, is greater than the probability of not-X.

One more fundamental axiom of the probability calculus can now be introduced. Two statements are said to be mutually exclusive if they cannot both be true at the same time. Under all traditional definitions of probability, the probability that one of two mutually exclusive state-

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6. Even with this admittedly artificial assumption, the problem is difficult enough. An entirely separate set of problems must be faced if we open the question to include the more realistic situations where a party's case depends on the conjunction of several propositions and inferences made upon inferences. *See* Schum, Book Review, 77 MICH. L. REV. 446 (1979); Wagner, Book Review, 1979 DUKE L.J. 1071.

ments will be true is equal to the sum of their individual probabilities. That is, if A and B are mutually exclusive, then

$$P(A \text{ or } B) = P(A) + P(B).$$

In the present case, X and not-X are mutually exclusive since a statement cannot be both true and false. Furthermore, P(X or not-X) must equal one. It is certain that either X will be true or it will be false. It follows from this assumption that

$$1 = P(X) + P(\text{Not-X}).$$

Looking at this equation, it is obvious that the statement that X is more probable than not-X is equivalent to saying that P(X) is greater than .5.

With this relatively simple derivation, the description of plaintiff's burden has been translated to the showing that P(X) is greater than .5. This interpretation of the preponderance standard is frequently relied upon by the courts.[7] But how is such a requirement to be understood? Typically statements are considered either true or false. What interpretation or meaning can be given to the probability of a statement's truth? The most commonly given interpretation of this type of measure describes the probability in terms of the relative frequency, the proportion of times, that the statement would be true over a long series of identical experiments or investigations. For example, the probability that a single fair throw of a fair die will show a four is equal to one-sixth, because over many throws of the die it is believed that one-sixth of them will turn up a four. Similarly, it might be said that the probability is one-eighth that a single law student chosen at random will be left-handed, because, out of numerous random choices, one-eighth of the selections would result in a student displaying this characteristic. This interpretation could also follow from the fact that one-eighth of all of the students in law school were left-handed, provided the choosing could actually be done randomly every time.[8]

An occasionally raised argument against applying even the simplest probability notion to legal factfinding is a conception, or rather a misconception, that probability statements make sense only when made about a future event. Legal factfinding usually concerns itself with what has already happened and probability theory is thought to be irrelevant to such questions. At one point, this notion had even received

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7. *See supra* note 5.
8. For a more thorough explanation of the relative frequency concept of probability and of the "subjectivist" approach which follows *infra*, notes 11-15 and accompanying text, see Cullison, *Probability Analysis of Judicial Fact-Finding: A Preliminary Outline of the Subjective Approach*, 1969 U. TOL. L. REV. 538, 538-63.

support from the New York Court of Appeals when it rejected the introduction of probabilistic evidence relevant to a past event, explaining that "[t]he fact to be established in this case was not the probability of a future event, but whether an occurrence asserted by the people to have happened had actually taken place."[9]

This rejection of the use of probability statements to apply to uncertain past events, however, does not hold up to scrutiny, and more recent writers are in agreement that it need not stand in the way of the use of probability analysis at trial.[10] The probability that a die already thrown, but unseen, has come up a four is the same as the probability that the die will come up a four when next thrown. Similarly, the probability that a given law student already chosen at random will turn out to be left-handed when asked is equal to the probability that a student yet to be chosen at random will have this characteristic.

A more serious problem with applying the relative frequency probability concept in trial is that for the typical factual issue, unlike the examples just given, it is difficult, if not impossible, to conceptualize what a large number of identical trials would mean. One can conceive of a large number of identical experiments tossing a die or choosing a single student at random. However, it hardly makes sense to speak of the proportion of times one expects to find X true in a large number of identical cases involving the same parties and complex situation. Legal decisionmaking deals with events that are not only in actuality unique (every throw of a die is unique), but also conceptually unique so that the frequency interpretation of probability statements cannot comfortably be applied to them.

In such situations, a second interpretive theory of probability, distinct from the frequency interpretation, seems more appropriate.[11] The formulation of what are referred to as "subjective" or "personal" probabilities rests on the notion that an individual's statements such as "$P(X) = C$," where C is some number between 0 and 1, can be under-

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9. People v. Risley, 214 N.Y. 75, 86, 108 N.E. 200, 203 (1915). This case is discussed in Tribe, *Trial By Mathematics: Precision and Ritual in the Legal Process*, 84 HARV. L. REV. 1329, 1344-45 (1971).

10. M. FINKELSTEIN, QUANTITATIVE METHODS IN LAW 62-63 (1978); Tribe, *supra* note 9, at 1344-45.

11. Iversen, *Operationalizing the Concept of Probability in Legal-Social Science Research*, 5 LAW & SOC'Y REV. 331 (1971); Kaplan, *Decision Theory and the Factfinding Process*, 20 STAN. L. REV. 1065, 1066-67 (1968). While the basic idea behind subjective probability has apparently existed for a long time, the rigorous development of the concept is relatively recent, occurring within the past sixty years. *See* Kaye, *The Laws of Probability and the Law of the Land*, 47 U. CHI. L. REV. 34, 42 n.31 (1979).

stood as stating the speaker's degree of belief in X's truth. This in turn is reflected in his willingness to place a bet on the proposition or, rather, his response to different wagers offered to him. So, for example, a person indifferent to taking either side of a bet regarding a statement's truth, when offered five-to-one odds, is said to possess a subjective probability of one-sixth that the statement is true. If he favors one side or the other of this offered bet even slightly, his subjective probability is said to be either higher or lower than one-sixth. There are various formulations of subjective probability theory and each could be developed in far more detail than here. However, for present purposes, it suffices to state that a trier would have a subjective probability of greater than .5 that X is true if he would choose to bet that way when instructed to pick one side of an even money bet about X.[12]

Subjective probabilities depend, of course, on the individual making the probability statement. However, it can be shown that everyone obeys all of the conventional rules of probability theory as long as it is postulated that the decisionmaker displays some characteristics of rational behavior, in the sense of utility or profit maximization. The decisionmaker must be consistent in assigning probabilities and the probabilities assigned to X and not-X must obey the rule:

$$P(X) + P(\text{not-}X) = 1$$

If these factors are not met, it can be shown that, by a careful choice of bets against him, the decisionmaker can be turned into a "money pump" in favor of one side or the other.[13] It may also be supposed, although subject to somewhat more debate, that the "subjectivist" decisionmaker would turn "objectivist" on any occasion when an objective relative frequency probability estimate can be made and is available to him. That is, the decisionmaker might be required to give a subjective

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12. It should be noted that as the notion is developed, the person whose statement of subjective probability is being considered is put in a position where he *must* choose one side or the other; he cannot simply sit out the game. This becomes important when the concept is applied to the legal factfinder.

If it seems somewhat oppressive to demand a choice, even in this metaphorical sense, a more rigorous development of the subjective interpretation would avoid this impression. Thus, the individual's choice could be arranged as one where he can only win. He might be asked whether he would prefer the chance to get a wonderful gift if the proposition X turns out to be true or the chance to get the same gift if X turns out to be false. In such an instance, he would have no reason not to choose and to do the best he could.

As an example in a nonlegal context of a probability statement which makes sense only under the subjective interpretation, consider the statement, "I'd say there's a five percent probability that the Mets will make the World Series this year."

13. Kaye, *supra* note 11, at 43 n.32.

probability of exactly one-sixth to the possibility of a fair die turning up a four following a fair throw, for example, if he is to be considered rational, or at least someone whose decisions are worthy of our attention and respect.[14]

Such a formulation of the preponderance of the evidence standard calls for the trier of fact to find for the plaintiff if and only if the probability of the plaintiff's assertion about the fact in dispute is greater than .5. It is appropriate and necessary to ask what justification exists for using this particular decision rule or, in fact, for using any rule under the banner of "the preponderance of the evidence." It could be argued that this type of rule and particularly the choice of the .5 benchmark are unavoidable. If one chose a point below .5, victory would clearly be given to the weaker of two cases, and to pick any number greater than .5 but less than 1.0, since certainty cannot be required, would be an "arbitrary" selection, since no natural or obvious breakpoint exists between the two numbers.[15]

Other litigation decisions, however, are made under rules calling for proof "by clear and convincing evidence" or "beyond a reasonable doubt." Both of these standards call for some kind of evaluation in this realm of greater probabilities, even if the measure may not be exactly quantified. In fact, in the case of the criminal standard, it is generally thought to be appropriate that no particular mathematical measure is set forth. It might be suggested that the reason the ordinary civil standard is lower and more easily met than the other two is that decisions to be made under the former standards are generally less important and of less consequence than other litigation.[16] This generalization hardly seems convincing, given a world of multi-million dollar civil suits.

A more satisfactory explanation for the appropriateness of the preponderance standard in ordinary civil suits is that it appears to treat the two parties to the litigation equally. To do otherwise would be to take sides unfairly, to impose a burden on one party not imposed on the other. This argument that the standard is the only "fair" one under the

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14. *Id.* at 44 n.35; Tribe, *supra* note 9, at 1348. Of course, a rational person might have reasons to suspect that a given die or a given throw is not "fair" and that hence the probability of a particular number appearing would not be one-sixth. That is why it is critical to stipulate that a fair situation exists. The fact that the probability estimate may be different given more information is a feature of both the frequency and subjective interpretations. *See infra* note 57 for a discussion of Bayes' Theorem.

15. M. FINKELSTEIN, *supra* note 10, at 66.

16. *See* Jackson v. Delaware, L. & W. R. Co., 111 N.J.L. 487, —, 170 A. 22, 23-24 (1933).

circumstances has great intuitive appeal and seems, until recently, to have been unquestioned.[17] Toward the conclusion of this Article, however, a recent analysis, suggesting that the question of "fairness" may be more complex than is first imagined, will be explored. Consideration will be given to Professor Finkelstein's contention that, despite all its virtues, this decision standard may not treat the parties equally in one respect; it may well result in more erroneous decisions going against one party than the other.

The principal argument given today as justification for the ".5 or better" rule, at least in academic circles, is one that might not be intuitively apparent. It can be demonstrated that this rule is the one which must be adopted if the decisionmaker's goal is to minimize the absolute number of total errors which will arise from the course of decisions in the long run.[18] Assuming that the plaintiff and defendant dispute only the truth of a single proposition, X, then the total number of instances in which either the plaintiff or the defendant is denied a verdict erroneously will be minimized if the verdict is granted to the plaintiff if and only if he has shown the probability of X being true to exceed, even by the smallest measure, .5. The argument for adoption of such a rule, which promises to minimize errors, is obvious. If one assumes that the disutility of an erroneous verdict in a civil suit is the same whether that verdict incorrectly goes against a plaintiff or a defendant,[19] arriving at the desirability of the rule, minimizing total errors, seems to follow from the most simple rule, utilitarian calculus.[20]

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17. M. FINKELSTEIN, *supra* note 10, at 65-66; Winter, *supra* note 3, at 337.

18. Ball, *The Moment of Truth: Probability Theory and Standards of Proof*, 14 VAND. L. REV. 807, 822-23 (1961); Cullison, *supra* note 8, at 569; Lempert, *Modeling Relevance*, 75 MICH. L. REV. 1021, 1033-34 (1977). For the most general mathematical proof in this area, see Kaye, Book Review, 89 YALE L.J. 601, 605 n.19 (1980).

19. This assumption seems compelled either by the practical difficulties of arriving at any alternative figures worthy of confidence or by an affirmative belief that to hold otherwise would introduce an unacceptable bias into the trial process. *See* M. FINKELSTEIN, *supra* note 10, at 67; Kaye, *The Paradox of the Gatecrasher and Other Stories*, 1979 ARIZ. ST. L.J. 101, 103; Lempert, *supra* note 18, at 1033-34. *But see* Kaplan, *supra* note 11, at 1072.

20. On the utility calculation in this situation, see Kaye, *Probability Theory Meets Res Ipsa Loquitur*, 77 MICH. L. REV. 1456, 1467 n.43 (1979). Making the decision one of utility also explains why the criminal standard of "beyond a reasonable doubt" is so very different from the civil standard. It is not because criminal cases are generally "more important" than civil cases, but rather that in the criminal situation the disutilities of the two different types of errors are clearly not identical. The disutility of the erroneous conviction of an innocent person is thought to be far greater than the disutility of an erroneous acquittal of a guilty one.

Most authorities translate the justification for the rule from the minimization of errors to the maximization of utility, but one should not have to be a utilitarian to find much appeal in the rule of greater than .5. Whatever ethical theory one holds to be important, it seems that erroneous verdicts must be regarded as undesirable and to be avoided, all other things being equal, as often

III. Two Cases

At this point, the lengthy development of the preponderance standard, culminating in a rule stated in terms of a probability of .5 or greater, may seem to have been a great labor to very little effect. One may easily believe this endeavor has been merely a matter of restating the obvious and taking pains to restate it in what is, for many, the more difficult form of a probability statement. The actual result may seem uncontroversial and unassailable. But this is not the case. The ".5 or greater" interpretation of the preponderance standard is far from universally adopted,[21] and has been the subject of much criticism.

As an introduction to the opposing views, consider two cases, both decided by the Supreme Judicial Court of Massachusetts in the 1940's, which appear to have brought this debate to the surface and are currently considered central to any discussion of the topic. The situations they present read almost like the hypotheticals one would have to invent for purposes of discussion were they not already available.

Sargent v. Massachusetts Accident Co.[22] involved a suit brought by the beneficiary of an accident insurance policy issued to the beneficiary's son, Upham Sargent, "a young man of twenty-one, financially comfortable, mentally well-balanced, vigorous, athletic, resourceful, courageous, a good swimmer, and of some experience in living in wild country without provisions."[23] Despite these attributes, Sargent never returned from a particularly adventurous journey, an attempt to direct a kayak down the treacherous Nottaway River of Northwest Quebec. The insured was last seen on September 8, 1934. In subsequent months, his paddle and a part of his kayak were found, but no other evidence of what happened to Upham Sargent was ever discovered. The terms of the insurance policy on which a claim was brought covered death due solely to accident. Thus, the case depended on whether the plaintiff had proved by a preponderance of the evidence, which included that presented above along with other information attesting to the foolhardiness of attempting to take a kayak down the Nottaway, that the insured died from an accident within the terms of the policy.

The trial court directed a verdict for the defendant insurance com-

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as possible. The question, in any event, becomes what other values society wants to be weighed against the strong appeal of the error minimizing rule.

21. "Some courts have boldly accepted this view." McCormick, *supra* note 2, at 794.

22. 307 Mass. 246, 29 N.E.2d 825 (1940).

23. *Id.* at 247, 29 N.E.2d at 826.

pany.[24] The Supreme Judicial Court of Massachusetts, in setting aside the verdict and entering a judgment for the plaintiff, presented its own version of the preponderance standard.

> The burden of proof that is on the plaintiff in this case does not require him to establish beyond all doubt, or beyond a reasonable doubt, that the insured died from accidental injury within the policy. He must prove that by a preponderance of the evidence. It has been held not enough that mathematically the chances somewhat favor a proposition to be proved; for example, the fact that colored automobiles made in the current year outnumber black ones would not warrant a finding that an undescribed automobile of a current year is colored and not black, nor would the fact that only a minority of men die of cancer warrant a finding that a particular man did not die of cancer. . . . The weight or ponderance of evidence is its power to convince the tribunal which has the determination of the fact, of the actual truth of the proposition to be proved. After the evidence has been weighed, that proposition is proved by a preponderance of the evidence 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 . . . .
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> Upon the evidence, in the opinion of a majority of the court, a jury could find, not merely that there was a greater chance that the insured met his death by accident falling within the policy than that he met a different fate, but that death by accident within the policy was in fact indicated by a preponderance of the evidence.[25]

The second case, *Smith v. Rapid Transit, Inc.*,[26] involved a far less romantic journey, that of Betty Smith driving her automobile down Main Street in Winthrop, Massachusetts. While on this ride, she was forced off the road and into a parked car by a bus, which she described only as a "great big, long, wide affair."[27] In her suit, she apparently only offered evidence that the defendant company was the sole bus operator authorized by the department of public utilities to operate on that street, although private or chartered buses were not precluded from using it. Massachusetts' Supreme Judicial Court, quoting at

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24. *Id.* at 246, 29 N.E.2d at 825.
25. *Id.* at 250-51, 29 N.E.2d at 827 (citations omitted).
26. 317 Mass. 469, 58 N.E.2d 754 (1945).
27. *Id.* at 469, 58 N.E.2d at 754.

length from *Sargent*, overruled exceptions to a verdict directed for the
defendant, stating, "The most that can be said of the evidence in the
instant case is that perhaps the mathematical chances somewhat favor
the proposition that a bus of the defendant caused the accident . . .
[and] this was not enough."[28]

The opinions in these cases point to two general themes of impor-
tance to this discussion. First, it has been argued that the preponder-
ance standard requires that the factfinder do more than arrive at a
conclusion about the relative likelihood of the truth of the plaintiff's
contentions. He must act only on the "actual belief in its truth," a con-
cept which is the subject of the next section of this Article. Next, a
distinct question suggested by the cases and much argued since must be
considered. Neither case contained an offer of general statistical evi-
dence to bolster the plaintiff's case, such as, in *Smith*, the proportion of
all buses going down Main Street operated by the defendant company.
Nevertheless, the opinions are construed to support the proposition that
such evidence could never be regarded as sufficient to meet the prepon-
derance standard. It is contended that no party can meet his burden
only on what is referred to as background statistical evidence and that a
minimum of particularized or individualized evidence is always re-
quired. This issue presents a question not necessarily of how "high" a
standard is called for, but of what type of evidence can be permitted to
meet the standard.

IV.   "ACTUAL BELIEF IN TRUTH"

Perhaps the most forceful argument in favor of an interpretation
of the preponderance standard instructing the factfinder to reach a de-
cision based only on his "actual belief" as to the truth of contested facts
is found in a 1906 article by William Trickett.[29] The author first con-
siders the rule which he finds in the then current authorities, much to
his dissatisfaction, to be the preponderance of probabilities rule. Trick-
ett observed the following:

> A corollary from this rule would be that the juror or the judge
> must in many cases decide in favor of A or B, the parties to
> the suit, that a fact did or did not occur, although he does not
> believe that it occurred or did not occur.
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>   . . . [T]o believe that there is this greater degree of evi-

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28. *Id.* at 470, 58 N.E.2d at 755.
29. Trickett, *Preponderance of Evidence, And Reasonable Doubt*, 10 FORUM 75 (1906).

dence of occurrence than of non-occurrence, is not to believe
the occurrence, rather than the non-occurrence.[30]

These rather cryptic comments are given some substance by a hypo-
thetical case Trickett presents. He proposes that party A sues party B
on a note, the execution of which B denies, and that the two gather up
teams of witnesses to testify on the issue of whether or not the signature
is in B's handwriting. First, six witnesses testify in A's favor while only
five testify for B. No difference appears in the credibility of any of the
witnesses involved. Trickett concludes that, while any prudent and
sensible person would remain in a state of doubt, neither believing nor
disbelieving that B had signed the note, the "ordinary man, juror or
judge" would be compelled by the preponderance criterion to find for
A in a court of law.[31] With this reading in mind, no wonder he argues
that:

> The rule indicated results in palpable absurdity. The ob-
> ject of the law is, or ought to be, to secure the sequence of
> certain results upon certain objective facts. If B signed the
> note he ought to be compelled to pay it. It would be, of
> course, inadmissible to hold that the absolute certainty of the
> jury that he signed it, should be the preliminary to this com-
> pulsion. But would it be too much to hold that the jury
> should believe, at least in some low degree, that he signed it?
> Is not the principle abhorrent that B may be coerced into pay-
> ing a sum of money to A, when the jury does not believe, even
> in a faint degree, that he promised to pay it, simply because it
> believes that, of the plaintiff's and defendant's respective
> pieces of evidence, that of the former is heavier than that of
> the latter?[32]

It seems clear that Trickett's objection to the preponderance rule,
as he interprets it, is premised on the belief that "weighing the evi-
dence" somehow commits the trier of fact to reach a result rigidly
based on the number of witnesses or the gross volume of evidence. Per-
haps this conclusion was prompted by the absence, at the time, of a
well developed treatment of what has been called the subjective inter-
pretation of probability statements. Still, this is hardly a reading of the
preponderance standard, or even of the word "evidence," that com-
mends itself to common sense. But, even though later authorities clari-
fied the fact that the preponderance standard contemplates evidence as

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30. *Id.* at 77-78.
31. *Id.* at 77.
32. *Id.* at 78.

measured by its ability to persuade, and not by its sheer bulk, they still find appeal in Trickett's idea.[33] There continues to be a contention that "belief" is a separate and distinct goal, which the factfinder is bound by duty to aspire to. So, in 1944, Professor McBaine condemned the notion that the jury should be instructed only to consider whether the plaintiff's evidence "is stronger or more convincing than the evidence supporting his opponent's assertions."[34] This argument is based on what initially appears to be a very appealing proposition.

> No prudent man would act as to a matter of importance to him if, after talking with several of his acquaintances, his state of mind is: "I think I will make this investment since what I have heard favorable to it impresses me more than what I have heard against it." People of prudence do not take important action involving their self interests when they know no more than that the evidence for taking an important step is stronger for taking it than it is for not taking it. Before acting they entertain stronger convictions.[35]

Unfortunately, if the prudent man thinks he is avoiding a decision by declining to invest under the circumstances, he operates under the crudest form of self-delusion. The choice not to buy is, in itself, a decision. Such a decision certainly will have consequences, as would a decision to invest. The identical situation confronts the factfinder at trial. As was noted earlier, the decision facing a jury is not whether to decide, for they are committed to that by their role. Rather it is how to decide which of two alternatives, a verdict for the plaintiff or for the defendant, shall be the outcome. This decision must be faced strictly on the basis of information then available.

Trickett and McBaine do not appear, by asking that the jury's goal be a "stronger conviction," to be arguing simply for a higher standard of proof in the quantitative sense. It is doubtful that they would be any more satisfied with a rule requiring a probability of greater than .6 or

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33. *See* 9 J. WIGMORE, EVIDENCE § 2498 (3d ed. 1940); James, *supra* note 1, at 53. For cases, in addition to *Sargent*, adopting the "actual belief" formulation, see MCCORMICK, *supra* note 2, § 339, at 795 n.57.

   While the author did not undertake a survey of the law of other common law jurisdictions, it appears that a view similar to the American "actual belief" position has had its adherents and found its way into cases, at least in England and Australia. R. EGGLESTON, EVIDENCE, PROOF AND PROBABILITY 106-07, 109-11 (1978).

34. McBaine, *Burden of Proof: Degrees of Belief*, 32 CALIF. L. REV. 242, 248 (1944). The author's position seems to be confused. Toward the end of the article, when he offers recommendations for pattern jury instructions, his statement of the preponderance standard drops any reference to "actual belief in truth." *Id*. at 261-62.

35. *Id*. at 248.

.75. These scholars seem to be calling for what they perceive as a different kind of decisionmaking in the qualitative sense. The problem is that what they seek may be unobtainable in reality. It may soothe the conscience of everyone if courtroom controversies were decided and pronouncements made only on the basis of what is held to be "actual belief" in their wisdom. This practice certainly appears more appropriate than that of relying on the best guess in even the most important situations. But like the prudent investor, the conscientious juror is enmeshed in a difficult position from which he has no easy escape. Uncertainty makes educated guessers of everyone.

More recent commentators have criticized the belief-in-truth argument,[36] and it is tempting to regard it as nothing more than an aberration not worthy of serious consideration.[37] But the idea expressed by those earlier writers does not appear to be entirely a thing of the past. Recent writings by one British philosopher of science, as well as a few legal academicians building on his work,[38] have advanced the thesis that traditional probability theory, however formulated, is somehow inappropriate when applied to legal factfinding.

An entirely new, rather startling, formulation of probability has been advanced, the centerpiece of which seems to be abandoning the principle of additivity, the requirement that P(A) and P(not-A) must always equal one for any statement A.[39] This novel theory has been subjected to criticism from the outset.[40] The ensuing debate reaches such heights of theoretical abstraction in the theory of probability and formal logic that it is difficult to know what to make of it. What is noteworthy in the present context is that when the arguments finally touch ground and are applied to the trial process, the results of this

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36. *See* Ball, *supra* note 18; Cullison, *supra* note 8.

37. M. FINKELSTEIN, *supra* note 10, at 65.

38. L. COHEN, THE PROBABLE AND THE PROVABLE (1977); Brilmayer & Kornhauser, *Review: Quantitative Methods and Legal Decisions*, 46 U. CHI. L. REV. 116 (1978).

39. As discussed in Kaye, *supra* note 11, at 36-38, Cohen apparently considers the notion that the probability of a defendant's liability and the probability of his non-liability must equal one to be "paradoxical" in some way.

> 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 at .499? This hardly seems the right spirit in which to administer justice.

L. COHEN, *supra* note 38, at 75.

40. *See* Birmingham, *Remarks on 'Probability' in Law: Mostly, A Casenote and A Book Review*, 12 GA. L. REV. 535, 544-51 (1978); Kaye, *supra* note 11; Kaye, *supra* note 19; Schum, *supra* note 6; Wagner, *supra* note 6.

highly sophisticated and technical criticism sound strangely familiar. Thus, Professors Brilmayer and Kornhauser in a recent article, based heavily on this modern non-traditional theory of probability, conclude that "[i]t seems implausible to assume, however, that when we have little or no evidence about the truth or falsity of a statement we must be more than half sure that it is true, or else more than half sure that it is false."[41] Is this anything more than the wishful thinking of earlier writers? What is the careful juror, who is trapped after all in the jury box and not in the lecture room, to do? The authors suggest that the rational decisionmaker, faced with so little information that belief in nothing seems possible, should not give up all hope.

> He may then decide to introspect more carefully, consider gathering more information about the likelihood of *A* and *not-A*, or make a decision based on some criterion distinct from maximizing expected value. Each of these three tactics may present complex, unsolved intellectual problems for the decisionmaker, but it is not obvious why, in adopting one of them, he would be acting irrationally. One rational strategy that does not fit the Bayesian [subjectivist] model is a court's finding of "insufficient evidence," that is, that a party simply has not adduced sufficient evidence to warrant disturbing the status quo. That the Bayesian system does not adequately account for a conception such as "sufficient evidence" becomes clear upon examining the premise of additivity at greater length.[42]

How realistic is this advice, given the position the jury member is in? The authors suggest greater introspection, which is always a good idea but hardly guaranteed to lead out of any quandary, or even to make it more tractable. The second alternative suggested, that the jury "consider gathering more information," directly contradicts the trial process. Disputed facts must be decided by the jury during the process and on the basis of the information presented.[43] The value found in the trial process of simply reaching a conclusion, of settling disputes decisively and for all time, is well accepted and the authors offer no argument that such a fundamental feature of the process should be abandoned. They suggest, finally, that a decisionmaker has the option to "make a decision based on some criterion distinct from maximizing expected value," but provide no hint as to what other values might be

41. Brilmayer & Kornhauser, *supra* note 38, at 142 (footnotes omitted).
42. *Id.*
43. *See* Kaye, *supra* note 11, at 47.

considered nor as to why such an approach would be at all appropriate or desirable in the trial context.

More curious still is the authors' reference to a court's finding of "insufficient evidence" in a context which suggests they believe themselves to be describing present practice and not arguing for a new legal order. This phrase is explained in a civil case as the finding "that the plaintiff has not satisfied his burden of proof."[44] Indeed, in this situation, it can be stated that the plaintiff has produced "insufficient evidence" for his purposes, but it is hardly the case that the jury has acted on a belief that there was not sufficient evidence before them to arrive at a verdict. A verdict has been reached and it is definitely not one which preserves the status quo as the authors contend, at least if the doctrine of res judicata is recognized. The plaintiff has not only failed to get an order for relief from the defendant, but he has forever lost his chance to try again. This is indeed different from the pre-trial position as any plaintiff who has turned down a healthy settlement offer only to have a jury verdict go against him would clearly agree. The authors may wish to argue for a quite different legal order in which a jury, or the court acting on the law, could justifiably refuse to make a decision because the evidence offered is insufficient to create "actual belief" in either the plaintiff's or the defendant's contention. Such a refusal would leave both parties with undiminished rights; in particular, the right to try again. But, if this is their interest, they must justify such a significant reordering on the grounds of the specific values it would promote and not simply on the difficulty, under current rules, of reaching a decision. Moreover, they would have to take account of the particular problem, in such an order, of compensating for the loss in the value of a trial as an effective method of dispute resolution producing a conclusive result. Even under the present system, it would seem one of the least desirable outcomes, especially to the litigants, is a mistrial with its prospect of going through the whole exercise all over again.

It seems the early exponents of the actual-belief-in-truth concept regarded it as actually a way of increasing accuracy and limiting the number of errors. This belief, however, cannot be true, at least if the resultant standard deviates from one calling only for a decision based on the preponderance of the probabilities.[45] Most authorities now con-

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44. Brilmayer & Kornhauser, *supra* note 38, at 142 n.94.
45. At another point in their article, Professors Brilmayer and Kornhauser appear to accept the greater than .5 rule, though they refer to the "degree of belief of .5 or greater" as "probably" satisfying the preponderance standard. *Id.* at 139-40. It is unclear if this is an inconsistency on

clude that a jury instructed to find an "actual belief" before making a finding for the plaintiff, to the extent that the jury pays attention to the instruction at all, will act only when the subjective probability attained is substantially greater than .5.[46] Any argument for this result which increases the expected number of errors should be based on the articulation of and the commitment to other distinct values which it could be expected to further.

Lengthy quotes from the proponents of this position have been presented in an attempt to decipher the exact purpose these authors believe the actual-belief-in-truth requirement is designed to serve. What value does the requirement enhance that might possibly offset the increased number of errors that would be expected to follow from its adoption? To a great extent, these passages display a form of denial; namely, a denial that decisions have to be made and under conditions that are far from ideal. Beyond this, however, lies something much more complex. There exists the idea of a separate and independent value in having a judicial system that is seen, by the members of the community asked to serve as jurors and by the community at large which is expected to respect the outcomes of the system, to make decisions premised only upon the basis of "truth" and of "actual belief" and nothing else. Even if it is recognized that the best trial process will inevitably result in decisions involving great doubt and in fact some finite number of truly erroneous decisions, there is a good to be served, it is argued, by a rule which presents a different face to the outside world.[47]

This notion is not as far-fetched as it may first appear. Certainly, it is adhered to extensively in the criminal law area, but is it an idea

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their part or if it may be viewed as consistent upon realizing that the authors seem to favor a form of probability in which $P(X) = .5$ would be a harder standard to meet than it would be under any traditional theory of probability which accepts the additivity axiom.

46. Cullison, *supra* note 8, at 571. McCormick indicates that the actual-belief-in-truth rule seems equivalent to the "clear, strong and convincing proof" standard "hitherto thought to be appropriate only in exceptional cases." McCormick, *supra* note 2, at 795.

There is some empirical evidence to suggest that jurors told to decide by "a preponderance of the evidence" and nothing more may in effect translate this into a requirement substantially above .5. Simon & Mahan, *Quantifying Burdens of Proof*, 5 Law & Soc'y Rev. 319 (1971), report that a group of jurors questioned by the authors translated the preponderance standard into something like a need for a probability of .75 or greater. A group of judges, on the other hand, interpreted it as calling only for a probability of .55. *Id.* at 325. The result in the case of the jurors is open to criticism, however, as the question presented to them involved criminal law. In fact, they were asked at what probability they would "convict" the defendant. *Id.* Posing the question in this manner could have easily distorted the jurors' understanding of the standard.

47. For criticism of this notion, see Cullison, *supra* note 8, at 572-76.

which carries much weight in civil litigation? This may be, in the end, an empirical question. Would potential jurors be less willing to serve, or would they suffer some negative emotional consequence from having served, if the court asked them to take a measure of responsibility for decisions made even when "actual belief" does not exist? Would the public respect less decisions made by a system that only balanced probabilities and made no requirement that the factfinder be willing to state an "actual belief" in anything? The concept of "actual belief" being explored is obviously not a probabilistic or statistical concept. It is essentially a cultural or psychological question of when an individual is prepared, short of absolute certainty, to turn his innermost thoughts into a statement of "I believe" on which others may judge both that of which he speaks as well as him personally.

The arguments in favor of the actual-belief-in-truth standard apparently require that consideration and importance be granted to the appearance and public perception of the judicial process. Attention is to be given to the process independent of the results in any single case or set of cases. Consideration of such factors, however, does not require acceptance of the "actual belief" standard. However, such consideration serves to introduce a set of concerns which have not been dealt with up to this point. The next section of this Article returns to such questions with the advantage of a previous thoughtful analysis which acknowledges that the choice of a rule may require a willingness to accept a greater level of errors in return for furthering other important values and which attempts to offer some guidance as to what alternative values may be.

V. PURELY STATISTICAL EVIDENCE

The *Smith*[48] case, where a driver brought suit against a bus company claiming that its bus ran her off the road, provides a starting point for this discussion. In the actual case, the plaintiff offered no statistical evidence. Imagine that she had, however, offered evidence which established that during the period in question four of every five buses travelling down Main Street were owned by the defendant company. Suppose further that this were the only evidence presented by the plaintiff relative to the identity of the owner of the bus. If the identity of the owner of the bus were the only issue of fact in the case, how

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48. Smith v. Rapid Transit, Inc., 317 Mass. 469, 58 N.E.2d 754 (1945). *See supra* notes 26-28 and accompanying text.

should the trial proceed? Would the defendant be entitled to a directed verdict because the plaintiff had offered no "individualized" evidence about the owner of the bus in this case? Or, assuming that the defendant presented no evidence on this issue, would the plaintiff have been entitled to a directed verdict, since she had shown "by a preponderance of the evidence" that the bus was owned by the defendant? Or is it just a factual question for the jury, in which case one may well ask how the jury may apply the preponderance standard.

This hypothetical on the use of mathematically expressed background evidence is only one of a large number considered by Professor Tribe in his well-known article discussing the phenomenon which he terms "trial by mathematics."[49] Tribe's article covers many particular instances of the legal use of mathematical evidence and theory, but the overall purpose of his piece is to counter what he perceived, while writing in 1971, as the growing trend, at least in academic literature, towards a belief that mathematically described evidence and mathematical techniques of analysis should play a greater role in legal factfinding and in the analysis of legal rules.[50] Tribe presents a variety of arguments against the use of mathematics at trial, most of which rest on the proposition that the use of such evidence will too often lead to its inevitable misuse. "[T]he very mystery that surrounds mathematical arguments—the relative obscurity that makes them at once impenetrable by the layman and impressive to him—creates a continuing risk that he will give such arguments a credence they may not deserve and a weight they cannot logically claim."[51] So, for example, Tribe asserts that the jury, which has received quantified evidence as well as other "soft" or impressionistic evidence, will tend to be overly impressed and influenced by the former merely because it seems precise, scientific, and objective.[52]

In a recent critique of this article, Professors Saks and Kidd, both psychologists, argue that Tribe's arguments are based only on his personal assumptions about how well a lay jury can utilize such information and that his assumptions, when compared to the results of

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49. Tribe, *supra* note 9.

50. *Id.* at 1329-32. Tribe stated that he wrote his article "in reaction to a growing and bewildering literature of praise for mathematical precision in the trial process, a literature that has tended to catalogue or to assume the virtues of mathematical approaches quite as uncritically as earlier writers tended to deny their relevance." *Id.* at 1332 (footnotes omitted).

51. *Id.* at 1334.

52. *Id.* at 1358-60.

empirical studies of human decisionmaking, are clearly inaccurate.[53]
In particular, they review findings that indicate that most people, when
confronted with background statistical information in addition to case-
specific information, tend to undervalue, not overvalue, the back-
ground information.[54] Contrary to Tribe's assumption, individuals do
not tend to be overly impressed with statistical information, such as the
percentage of buses in the hypothetical. If anything, they give it too
little attention. As damaging as these empirical findings may be to
many of Tribe's arguments, his position is not necessarily completely
untenable. Tribe clearly states, throughout his work, that his concern
with the use of mathematics at trial is not only that it may increase the
number of erroneous verdicts, but that even if it were to decrease the
number of expected errors, there are other reasons to avoid the use of
mathematics. He contends that a trial must be considered not only as a
means to an end, but as an important social event in itself having "rit-
ual" value.[55]

Before further exploration of this argument, consider Tribe's view
of the bus hypothetical discussed earlier. What should be done when
only background statistical evidence is presented by the plaintiff?
Tribe correctly asserted that this need not necessarily lead to a directed
verdict for the plaintiff. It will not even have to be true that a rational
and sensible jury would have to find for Mrs. Smith, since by the time
the trial ends, more information will be known. Certain background
statistical evidence which points the finger at the defendant has been
introduced, but the plaintiff failed to introduce any other evidence on
point. Such information in itself may be regarded as highly relevant.
If it truly was the defendant's bus that was to blame, why was the plain-
tiff not able to get any other evidence to bolster her case? "[A]bsent
satisfactory explanation"[56] of the plaintiff's failure to come forward

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53. Saks & Kidd, *Human Information Processing and Adjudication: Trial by Heuristics*, 15
LAW & SOC'Y REV. 123 (1981).

> Influential as Tribe's paper has been, like much legal scholarship, it is a Swiss
> cheese of assumptions about human behavior—in this case human decision-making
> processes—which are asserted as true simply because they fall within the wide reach of
> the merely plausible, not because any evidence is adduced on their behalf.

Id. at 125 (footnotes omitted).

54. *Id.* at 126-31.

55. *See infra*, textual discussion beginning at note 60.

56. Tribe, *supra* note 9, at 1349. *See also* Kaye, *supra* note 19, at 106-08. Of course, the
reasoning behind this argument may be a bit circular. If the rule of law were that the plaintiff
could satisfy her initial burden of production by offering statistical evidence alone, then the fact
that she offered no additional evidentiary support might not be "suspicious." It might signify only
that she did not waste her resources gathering up more and better information when she had

with anything more than the general eighty percent figure, one may conclude that one's subjective probability that the defendant company's bus was responsible is far lower than .8 and even lower than .5.

It is important to note that such arguments do not signal, in any way, a difficulty with statistical evidence or probability theory. The probability that any statement is true will always be subject to change when new relevant information is available. If it is believed, or there exists some way of showing, that a given bit of information is more likely to be true if the defendant's bus were not involved than if it were, this should indeed make the probability estimate that it was defendant's bus decrease. Probability theory does more than merely conflict with this intuitive notion. It actually provides a mechanism, known as Bayes' Theorem, for quantifying the effect of such additional information.[57] Assume that, based on the statistical evidence offered, one initially believes there is an .8 chance that the defendant's bus was responsible for the mishap. Surprisingly, no additional evidence is presented regarding ownership of the bus; it seems six times as likely that plaintiff would have no further evidence to offer against defendant if it had not been, in fact, defendant's bus than if it had been. Bayes' Theorem would then support a conclusion that the probability that it

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enough to survive a motion by the defendant for a directed verdict. This circularity is probably more theoretical than real, however. The plaintiff would normally decide how much evidence to collect and bring to trial based on her concerns about what counterevidence the defendant might offer and not just on her desire to meet the minimum standard required to survive a motion for a directed verdict.

57. Bayes' Theorem is by now no stranger to legal literature. *See, e.g.,* Kaye, *supra* note 19, at 106-08; Tribe, *supra* note 9, at 1352. The Tribe article is part of a running debate. touched off by Finkelstein & Fairley, *A Bayesian Approach to Identification Evidence*, 83 HARV. L. REV. 489 (1970), on whether Bayes' Theorem should actually be used by the jury to interpret the accumulated effect of all of the evidence before it. *See* Kaye, *supra* note 11, at 34 nn.5 & 6.

The purpose in introducing Bayes' Theorem here is only to emphasize the fact that efforts to combine purely statistical evidence offered at trial with other information available to the jury are not at all inconsistent with probability theory, but may in fact be well explained by its techniques.

Before setting forth Bayes' Theorem, conditional probabilities should be defined. The conditional probability of X given E, written $P(X/E)$, is simply the probability that X will be true given that E is already known to be true. Thus, the probability that a fair die will turn up a four given that it turns up an even number of dots is one-third. The probability that the die will turn up a four given that it turns up an odd number of dots is, of course, zero.

Let X be a proposition and E a piece of information which may or may not be relevant to it. Then Bayes' Theorem, in one of its many forms, says

$$\frac{P(X)}{P(\text{not } X)} \cdot \frac{P(E/X)}{P(E/\text{not } X)} = \frac{P(X/E)}{P(\text{not } X/E)}$$

The ratio $P(X)/P(\text{not } X)$ is called the "prior odds" of X, that is, the odds that X is true considered before any knowledge of E. The ratio $P(X/E)/P(\text{not } X/E)$ is called the "posterior odds" of X. It represents the revised estimate of the odds of X being true once it is known that E is true.

was defendant's bus would only be .4, which would be insufficient to satisfy the plaintiff's burden.[58]

Of course, if the plaintiff could give a "satisfactory explanation" of why she was unable to produce additional individualistic evidence, the initial high probability would not be changed and plaintiff would have met her burden, at least in the sense of establishing a case which the defendant would then have had to meet with evidence of its own. Tribe agrees with this statement, but would depart from the strictly probabilistic model in the case where the initial background probability is so great or the inference to be drawn from the lack of other evidence is so relatively weak that the fact of the nonproduction of other evidence would not plunge the overall estimate below .5.[59] Even if the defendant company were shown to own ninety-nine percent of all buses running down Main Street, Tribe argues that this fact alone, absent "satisfactory explanation" of the absence of other proof, should as a matter of law never be sufficient to shift the burden of coming forward with evidence on the issue of identity to the defendant.[60] He argues that whether or not the subjective probability that it was the defendant's bus remains above .5,

> 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. To give less force to the plaintiff's evidentiary omission would eliminate any incentive for plaintiffs to do more than establish the background statistics. The upshot would be a regime in which the company owning four-fifths of the blue buses, however careful, would have to pay for *five*-fifths of all unexplained blue bus accidents—a result as inefficient as it is unfair.[61]

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58. Using the formula given *supra*, note 57, X represents the fact that it was defendant's bus that caused the accident. E represents the information that no other evidence besides background statistical evidence was offered by the plaintiff. The statement in the text is then equivalent to

$$\frac{80}{20} \cdot \frac{1}{6} = \frac{40}{60}$$

59. Tribe, *supra* note 9, at 1361.

60. *Id.* at 1349.

61. *Id.* at 1349-50 (emphasis in original; footnote omitted). Tribe makes essentially the same point in an earlier footnote.

> [C]ases like *Smith* are entirely sensible if understood . . . as insisting on the presentation of *some* non-statistical and "individualized" proof of identity before compelling a party to pay damages, and even before compelling him to come forward with defensive evidence, absent an adequate explanation of the failure to present such individualized proof.

The reasons offered by Tribe in support of his position are far from convincing. The argument that any incentive for the plaintiff to present less evidence than she maximally might could be extended to any case where a plaintiff has initially satisfied her burden of production by creating a subjective probability of greater than .5, but where another individual might desire, for some other reasons, to view more evidence. Tribe apparently would always prefer to be exposed to more evidence in such a case, but he provides no convincing argument that the case where the plaintiff uses only one particular type of evidence is analytically different, other than that he responds to it differently.

Beyond this point, one should recall that the main incentive that a plaintiff will have to present any evidence available will be her concern that the defendant, once allowed to offer evidence, will produce information tending to weaken the plaintiff's case. Tribe seems to suggest that admitting that the plaintiff can meet her burden of production by probability evidence alone is equivalent to handing her a victory. But the defendant will have something to say about that; he will usually be able to offer evidence tending to show that his bus was not involved, if that is the case. If the concern is primarily that incentives exist for the production of relevant evidence, it should be remembered that such incentives can affect the defendant as well as the plaintiff. If the plaintiff could show in her case that, for example, ninety-nine percent of all buses were owned by the defendant, might it not make most sense to shift to the defendant the incentive to come forward with more information? To act otherwise seems to simply create a disincentive for the defendant to undertake steps to investigate the accident.

Of course, there may be a number of instances when no more information will be available to either party no matter how hard each would try. For example, recall the still unanswered question of how Upham Sargent died in the woods.[62] In relation to such cases, Tribe's

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Id. at 1341 n.37 (emphasis in original).

It has been pointed out that information does not really come in two qualitatively distinct categories, "statistical" and "individualized." Saks & Kidd, *supra* note 53, at 151-54. Tribe is aware of this, but still finds the fact that people tend to believe there is a distinction important.

I am, of course, aware that *all* factual evidence is ultimately "statistical," and all legal proof ultimately "probabilistic," in the epistemological sense that no conclusion can ever be drawn from empirical data without some step of inductive inference—even if only an inference that things are usually what they are perceived to be . . . . My concern, however, is only with types of evidence and modes of proof that bring this probabilistic element of inference to explicit attention in a quantified way.

Tribe, *supra* note 9, at 1330 n.2 (emphasis in original; citation omitted).

62. Sargent v. Massachusetts Accident Co., 307 Mass. 246, 29 N.E.2d 825 (1940). *See supra* notes 22-25 and accompanying text.

analysis expresses doubts about allowing the plaintiff in any such case to prevail, saying it would be "inefficient" as well as "unfair" to make the defendant company pay for all such accidents no matter how careful its drivers have been. This statement is conclusory and highly questionable. Tribe enters into no efficiency-type analysis of the problem, nor will this Article. Still, it seems fair to ask why it would not be even less efficient to have a rule that allows the company to pay for none of the accidents caused by unidentified buses on Main Street no matter how much it uses the road nor how carelessly its drivers behave simply because in some instances particular buses are impossible to identify.

Further, although it may seem unfair that a company should be forced to pay for an accident it had nothing to do with, the possibility of such unfairness arises every time a case is decided under conditions of uncertainty. Does Tribe mean to suggest that there is nothing even arguably unfair in a rule allowing the company to avoid responsibility for those accidents it did cause and therefore leaving accident victims without compensation? It is possible, as Tribe argues, that issues of efficiency and fairness might ultimately support his position; however, it must be recognized that these issues are far more difficult than he acknowledges.

Perhaps the reason Tribe's arguments on this point appear so casual and weak-willed is that the principal thrust of his critique of mathematics in the courtroom, at least in the private law context, is a concern with the general impression which is created in the community by proceeding in this fashion as opposed to the particular results from its use in a given case. Whether or not it is "unfair" in some deeper sense to make the company pay even though no fault has been shown, the system would appear unfair, uncaring, and maybe even foolish if a defendant were made to pay for an accident with which he had been in no way connected by the kind of evidence normally expected. In a portion of the article, captioned "The Dehumanization of Justice," Tribe eloquently advances his belief in the importance of trial as ritual.

> Methods of proof that impose moral blame or authorize official sanctions on the basis of evidence that fails to penetrate or convince the untutored contemporary intuition threaten to make the legal system seem even more alien and inhuman than it already does to distressingly many. There is at stake not only the further weakening of the confidence of the parties and of their willingness to abide by the result, but also the further erosion of the public's sense that the law's fact-finding

apparatus is functioning in a somewhat comprehensible way, on the basis of evidence that speaks, at least in general terms, to the larger community that the processes of adjudication must ultimately serve. The need now is to enhance community comprehension of the trial process, not to exacerbate an already serious problem by shrouding the process in mathematical obscurity.

. . . .

One element, at least, of that ritual of conflict-settlement is the presence and functioning of the jury—a cumbersome and imperfect institution, to be sure, but an institution well calculated, at least potentially, to mediate between "the law" in the abstract and the human needs of those affected by it. Guided and perhaps intimidated by the seeming inexorability of numbers, induced by the persuasive force of formulas and the precision of decimal points to perceive themselves as performing a largely mechanical and automatic role, few jurors—whether in criminal cases or in civil—could be relied upon to recall, let alone to perform, this humanizing function, to employ their intuition and their sense of community values to shape their ultimate conclusions.

When one remembers these things, one must acknowledge that there was a wisdom of sorts even in trial by battle—for at least that mode of ascertaining truth and resolving conflict reflected well the deeply-felt beliefs of the times and places in which it was practiced. This is something that can hardly be said of trial by mathematics today.[63]

An initial observation about this passage is that it appears to contain an element of inconsistency. Tribe is concerned that jurors will be overly deferential to mathematical evidence and analysis and, therefore, too quick to give it credence and to be influenced by it. At the same time, he asserts that this type of material at trial "fails to penetrate or convince the untutored contemporary intuition."[64] If such evidence speaks so convincingly to the lay juror, why would it not have the same effect when it becomes known to "the larger community that the process of adjudication must ultimately serve"?[65] Of course, the two situations may be quite different, but it is not clear that they are and Tribe himself says nothing to support this.

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63. Tribe, *supra* note 9, at 1375-77 (footnotes omitted).
64. *Id.* at 1376.
65. *Id.*

As pointed out earlier, Tribe simply assumes certain facts about how jurors react to mathematical evidence and his assumptions have been questioned on the empirical evidence available. He likewise assumes that litigating parties and the general public would have the same uneasy and distrustful feeling about "trial by mathematics" that he has. Tribe offers no supportive evidence to demonstrate how the present trial process creates respect and confidence in its decisions, nor how a change in the system would create a different community appreciation.

Commenting on Tribe's argument that one problem with mathematical procedure in the courtroom is that it makes explicit the fact that the system allows some finite number of erroneous verdicts as the price paid for other ends,[66] psychologists Saks and Kidd remark:

> [S]uch a deliberate turning away from reality may serve neither the law nor the defendant. First of all, the symbolism is so at variance with the objective reality . . . and the subjective experience of judges and jurors, that this may be one more of the legal fictions that tend to undermine the law's own credibility. An institution that would so deliberately ignore real, measurable doubt and assert not that it has made the best decision it was able to but that it is "certain" it is correct, is unlikely to keep the masquerade going forever or to fool everyone. That is the harm that may be done the court.[67]

For these authors, the legal system would best find support for its decisions by appearing to operate on the available techniques of what might be called scientific decisionmaking.[68]

In reality, Tribe's arguments about the valuable ritual components of trial are based not on his knowledge about what the "deeply-felt beliefs" of our time are, but on his own opinions about what the fundamental beliefs of the society should be at their best. If this is the objec-

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66. *Id.* at 1372-75.

67. Saks & Kidd, *supra* note 53, at 156.

68. Consider also the following remark by Tribe in the introduction to his article:

[A]lthough the mathematical or pseudo-mathematical devices which a society embraces to rationalize its systems for adjudication may be quite comprehensible to a student of that society's customs and culture, those devices may nonetheless operate to distort— and, in some instances, to destroy—important values which that society means to express or to pursue through the conduct of legal trials.

Tribe, *supra* note 9, at 1330. Those important values can only be recognized by a student of a society through a careful and respectful examination of the ways that society goes about its important business. The best datum available is a thorough understanding of the "rationalizations" which the community does indeed embrace.

tive in his work, there may be much in it which can be agreed with, but the exact nature of his propositions should be more clearly spelled out.

In his article, Tribe gives primary attention to the criminal trial and is explicit about the elements of the ritual with which he is most deeply concerned. He refers to the presumption of innocence, the rights to counsel and confrontation, and the privilege against self-incrimination as "the principles [the community] holds important."[69] It is clear, however, that he believes these to be principles that the community *should* hold in high regard. Consider how he would respond to an observation, which might be made, that the majority of the population has lost respect for the criminal justice system because its insistence on these principles seems to result in letting criminals escape penalties because of technicalities. The legal system should, of course, acknowledge and show respect for the "deeply-felt beliefs" of the society of which it is a part, but it must also recognize that by its processes it can affect those beliefs for good or for worse. As Tribe remarks, there may indeed have been a "wisdom of sorts"[70] even in trial by battle in its time, but even so, the legal system of that time, and in particular legal scholars, would have been obliged to seek out improved methods and to make them available and understandable to the public.

Do scholars now investigating the use of formal decision theory, mathematics and statistics, as these apply to the preponderance of evidence standard and to other questions in procedure, have a better way? Only time will say. For the present, it should be stressed that advancing these ideas does not necessarily, as Tribe seems to feel, ignore the variety of complex and competing values which a trial serves in our society. Instead, such thinking emphasizes a different "ritualistic" perspective than Tribe does, but an important one nevertheless. There is value, of course, in the trial process retaining "human" qualities and dimensions. But, there is value as well in the legal system's being viewed as concerned about its errors and receptive to available resources which may serve, consistent with other important principles, to lessen those errors.[71]

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69. Tribe, *supra* note 9, at 1391-92.
70. *Id.* at 1392.
71. An interesting question for the present generation of lawyers which illustrates this tension between "precision and ritual" is how we should respond to the increasing amount of empirical evidence regarding the lack of accuracy of eyewitness testimony. We have long recognized that courts are particularly comfortable permitting findings to be based on such testimony even though we may feel it is no more probative than "statistical" evidence, which is not as well received. H. HART & J. MCNAUGHTON, EVIDENCE AND INFERENCE IN THE LAW 54-55 (1958). It also seems

VI. "EQUALIZING" ERRORS

Professor Tribe criticizes those who would inject mathematics into the trial process, because he finds them concerned with only one criterion of decisionmaking, the minimization of the absolute number of erroneous decisions, to the exclusion of other less objective criteria. Yet one of the writers most responsible for the increasing interest in "trial by mathematics," Professor Finkelstein, was the one to bring forward a very different objective than minimization of errors. He suggests that "trial by mathematics" gives support to Tribe's insistence on the need for particularized evidence in cases where background statistics have been introduced. Finkelstein points out that the decision rule which minimizes errors, the rule of .5 or greater, cannot be assumed to meet one of the possible objectives in that it will not necessarily treat the parties equally in the sense of distributing the expected errors evenly between the plaintiff and the defendant.[72] This is certainly not an intuitively easy conclusion to appreciate, and both Finkelstein and Professor Kaye, in his review of this argument,[73] offer lengthy numerical examples to make the point.

This Article does not attempt to duplicate such proofs but only to give a characterization of the results. In the hypothesized situation, a value P(X) has been assigned, based on many trials, corresponding to the degree of belief held in the plaintiff's assertion X after all the evidence has been given. There is, thus, a large collection of values of P(X), ranging from zero to one. There is no reason to think these values would be evenly distributed. Suppose, for example, that in a large majority of the cases, the plaintiff's case had been very convincing; that is, the various values of P(X), while they ranged all over the spectrum, were most often found on the high side, say in the range of .6 to .8. In deciding what value of P(X) to choose to minimize errors, the greater than .5 rule is still the answer. Under this rule, of course, more verdicts

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that court decisions based on such identification testimony are among those most representative of the "ritual" elements of trial which Tribe stresses.

In recent years, however, we have been made distressingly aware of how often such eyewitness testimony is mistaken and how it is much less reliable than it is generally perceived to be. *See* E. LOFTUS, EYEWITNESS TESTIMONY (1979). The "untutored contemporary intuition" may have great respect for and faith in the reliance on such testimony at trial, but the scientific findings of inaccuracy and misuse cannot be ignored. Surely, the law must respond to this new information by attempting to take measures designed for greater precision. For further discussion, see Weinstein, Book Review, 81 COLUM. L. REV. 441 (1981) (reviewing E. LOFTUS, EYEWITNESS TESTIMONY (1979)).

72. M. FINKELSTEIN, *supra* note 10, at 67-68.
73. Kaye, *supra* note 18.

for plaintiffs than defendants result, but this presents no problem. Plaintiffs on the whole were presenting stronger cases. Additionally, however, the expected number of errors favoring plaintiffs will be far higher than the expected number of errors favoring defendants.

In the example given by Kaye,[74] for instance, the .5 decision rule yields twenty-nine expected erroneous verdicts for plaintiffs and only eight expected errors in favor of defendants. Thus, the .5 rule produced an expected number of errors totaling thirty-seven. In this example, if the court decided on a rule awarding a verdict to plaintiff only if $P(X)$ were greater than .65, twenty errors could be expected to favor defendants and twenty-one to favor plaintiffs. The higher burden of persuasion has increased the "equality" of the procedure in some sense, but at the price of creating a greater number of expected errors.

Finkelstein argues that the equalization of errors as a distinct goal may influence the interpretation of the preponderance standard:

> [T]he maximization of correct results is a strong policy, but one not invariably to be preferred when others conflict with it. . . . Whether equalization of errors is the goal in any given context ought to depend on the extent to which total error would be increased by the pursuit of the equality, the degree of inequality if minimum error is achieved, and the relative importance of the competing policies.[75]

But how to take account of this equalization policy when the particular rule which would equalize errors would be, as Finkelstein admits, "unknown and in most cases unknowable"?[76] He suggests that while it may not be possible to fashion an "equalizing" rule directly, this goal is furthered by an approach to the preponderance standard such as in the *Sargent* opinion and in Tribe's analysis:

> [I]nsistence on particular evidence should be regarded not only as a way of reducing total error, but more significantly, as a way of distributing error more equally between plaintiffs and defendants over some assumed class of cases with a common subject matter. The insistence of the *Sargent* court on such evidence may be taken as an indication that both these purposes are condensed in the standard of proof by a preponderance of evidence.[77]

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74. *Id.* at 604-07. This example yielded a total of 130 decisions for plaintiffs and only 18 for defendants. *Id.* at 604.

75. M. FINKELSTEIN, *supra* note 10, at 69.

76. *Id.* at 73.

77. *Id.* at 78. *See id.* at 69.

Professor Kaye has pointed out the error in this argument.[78] Both his and Finkelstein's numerical examples of the equalization test result in the plaintiff establishing a probability substantially in excess of .5, but this is only because of the distribution of the numbers P(X) used as an example. If the distribution of P(X) were different, so that it leaned more towards lower values, the test would call for a decision in favor of the plaintiff when P(X) was *lower* than .5. This is surely not what the *Sargent* opinion, Tribe, or anyone else has in mind.

Kaye, in going beyond this observation, questions the value of this type of "equalization":

> Mistakes do not cancel one another out: it is no solace to the defendant who should have prevailed but did not that somewhere there is or will be a similarly affected plaintiff. Unless plaintiffs and defendants are different sorts of people such that defendants deserved to be favored, I cannot imagine why we should seek this sort of "equality."[79]

Kaye additionally argues that the greater than .5 rule itself "incorporate[s] the only meaningful principle of equality between plaintiffs and defendants,"[80] in that its derivation followed from the assumption of equality of the disutility of all errors whether they go against one party or the other.

VII. CONCLUSION

This discussion of the distribution of expected errors serves principally to remind us of how little we know and can ever hope to know about the ultimate wisdom of our decisions. We expect there will be errors, but in general we will never discover which decisions are our mistakes, nor will we know the actual level or distribution of the errors. Against such uncertainty the preponderance of the evidence standard seems a puny tool indeed. It is no wonder that writers would want to see it as stronger than it is or to improve upon it if they could. But the uncertainty about everything except that there will be errors remains undiminished. If anything, it grows the more closely we observe it, much to our displeasure. The interpretation of the preponderance standard as a preponderance of probabilities rule, calling only for a subjective probability of anything greater than .5, seems in this light to offer

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78. Kaye, *supra* note 18, at 607.
79. *Id.*
80. *Id.* at 608. Kaye even suggests a third possible meaning of "equality," in that we could ask that the proportion of verdicts for each party which are erroneous be equal. *Id.* at 606 n.21.

more than might first have been imagined. It is a crude standard by any measure, but it offers us something which can be of great value, the expectation of the minimal number of errors in decisions. In and of itself, the choice of this rule and the enunciation of this as a goal may have great "ritualistic" value of the type Professor Tribe cautions us to consider. Trying to be right as often as possible may be the best we can do.[81]

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81. Forthright consideration of the risks of error inherent in the trial process as a way of approaching questions of burden of proof has recently received support from the United States Supreme Court. *See* Santosky v. Kramer, 102 S.Ct. 1388 (1982); Addington v. Texas, 441 U.S. 418 (1979).