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Burdens of Persuasion in Civil Cases: Algorithms v. Explanations

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Ronald Jay Allen and Sarah Lively

Abstract

The conjunction paradox has fascinated generations of scholars, primarily because it brings into focus the apparent incompatibility of equally well accepted conventions. On the one hand, trials should be structured to reduce the total number, or optimize the allocation, of errors. On the other hand, burdens of persuasion are allocated to elements by the standard jury instruction rather than to a case as a whole. Because an error in finding to be true any element of the plaintiff's cause of action will result in an error if liability is found, errors on the overall case accumulate with errors on discrete issues. This, in turn, means that errors will neither be minimized nor optimized (except possibly randomly). Thus, the conventional view concerning the purpose of trial is inconsistent with the conventional view concerning the allocation of burdens of persuasion. Two recent efforts to resolve this conflict are examined in this article. Dean Saul Levmore has argued that the paradox is eliminated or reduced considerably because of either the implications of the Condorcet Jury Theorem or the implications of super majority voting rules. Professor Alex Stein has constructed a micro-economic explanation of negligence that is also offered as resolving the paradox. Neither succeed, and both fail for analogous reasons. First, each makes a series of ad hoc adjustments to the supposedly formal arguments that are out of place in formal reasoning. The result is that neither argument is, in fact, formal; both arguments thus implicitly reject the very formalisms they are supposedly employing in their explanations. Second, both articles mismodel the system of litigation they are trying to explain in an effort to close the gap between their supposedly formal models and the reality of the legal system; and when necessary corrections are made to their respective models of litigation, neither formal argument maps onto the reality of trials, leaving the original problem untouched and unexplained. These two efforts are thus very much similar to the failed effort to give a Bayesian explanation to trials and

juridical proof, which similarly failed due to the inability to align the formal requirements of subjective Bayesianism with the reality of modern trials. We also explore the reasons for this consistent misuse of formal arguments in the evidentiary context. Rationality requires, at a minimum, sensitivity to the intellectual tools brought to a task, of which algorithmic theoretical accounts are only one of many. Another, somewhat neglected in legal scholarship, is substantive explanations of legal questions that take into account the surrounding legal landscape. As we show, although the theoretical efforts to domesticate the conjunction paradox fail, a substantive explanation of it can be given that demonstrates the small likelihood of perverse consequences flowing from it. The article thus adds to the growing literature concerning the nature of legal theorizing by demonstrating yet another area where legal theorizing in one of its modern conventional manifestations (involving the search for the algorithmic argument that purportedly explains or justifies an area of law) has been ineffectual, whereas explanations that are informed by the substantive contours of the relevant legal field have considerable promise.

BURDENS OF PERSUASION IN CIVIL CASES: ALGORITHMS V. EXPLANATIONS

By

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I. INTRODUCTION

Algorithms are wonderfully useful in efficiently resolving many complex problems (such as long division), may very well be critical to surviving in a hostile environment,[1] and consequently, a predilection for them may be hardwired into the human brain. As one neuroscientist said about the search for patterns in complex data, "we're showing . . . that basically, your brain is set up to look for that sort of structure . . . even if there were no structure there."[2] Whatever the value of such a search when successful, as Dr. Huettel's comment implies, the search may come up empty. And it may have deleterious consequences by generating an erroneous decision under an inappropriate algorithm and by wasting resources in the ill-advised search.[3]

A considerable body of legal scholarship has been produced examining the utility of various algorithms for predicting, explaining, or prescribing the law, some useful and

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[1] If a child wanders down to the river and gets eaten by an alligator, survival of the family's genes may be facilitated by inferring a rule from the observation.

[2] Quoted on CNN.com, 1-10-03; *see also* Scott A. Huettel, Peter B. Mack & Gregory McCarthy, *Perceiving Patterns in Random Series: Dynamic Processing of Sequence in Prefrontal Cortex*, 5 NATURE NEUROSCIENCE 485 (2002).

[3] For example, if the family whose child was eaten by an alligator only gets protein from the river it will have to develop some other alternative to its tragedy than "Don't go down to the river."

others less so.[4] In the field of evidence, this phenomenon is most obvious in the very interesting work that has been done on the relationship between probability theory and the legal process.[5] A significant portion of that work, in turn, has been driven by efforts to domesticate what are known as the proof paradoxes.[6] The simplest example of the proof paradoxes emerges from the interrelationship between the conventional conception of trials as designed either to optimize fact finders' utilities or the distribution of errors and the equally conventional instruction in civil cases that plaintiffs must prove each essential element to a preponderance of the evidence, which is understood to mean greater than a .5 probability.

For either utilities or errors to be optimized, the probability of the conjunction of the elements that form liability must exceed .5, not the discrete elements themselves. This can be seen easily with the help of a stylized example. Suppose there are two elements to a cause of action, such as negligence and causation in a tort action. If either is false, the defendant deserves to win. If each is proven to a .6 probability, and if they are

[4] *See, e.g.,* Christine Jolls, Cass R. Sunstein & Richard Thaler, *A Behavioral Approach to Law and Economics*, 50 STAN. L. REV. 1471 (1998); RICHARD A. POSNER, ECONOMIC ANALYSIS OF LAW (6th ed. 2003). For an exploration into the limits of algorithms see Ronald J. Allen & Ross M. Rosenberg, *Legal Phenomena, Knowledge, and Theory: A Cautionary Tale of Hedgehogs and Foxes*, 77 CHI.-KENT L. REV. 683 (2002) [hereinafter *Hedgehogs*], and Ronald J. Allen & Ross M. Rosenberg, *The Fourth Amendment and the Limits of Theory: Local Versus General Theoretical Knowledge*, 72 ST. JOHN'S L. REV. 1149 (1998).

[5] *See*, *e.g.*, Laurence H. Tribe, *Trial by Mathematics: Precision and Ritual in the Legal Process*, 84 HARV. L. REV. 1329 (1971); Richard O. Lempert, *Modeling Relevance*, 75 MICH. L. REV. 1021 (1977) [hereinafter *Modeling Relevance*]; Craig Callen, *Notes on a Grand Illusion: Some Limits on the Use of Bayesian Theory in Evidence Law*, 57 IND. L.J. 1 (1980) [hereinafter *Grand Illusion*]; D.H. Kaye, *Quantifying Probative Value*, 66 B.U. L. REV. 761 (1986); D.H. Kaye, *Clarifying the Burden of Persuasion: What Bayesian Decision Rules Do and Do Not Do*, 3 INT'L J. OF EVIDENCE & PROOF 1 (1999); Ronald J. Allen, *Clarifying the Burden of Persuasion and Bayesian Decision Rules: A Response to Professor Kaye*, 4 INT'L J. OF EVIDENCE & PROOF 246 (2000).

[6] *See generally* L. COHEN, THE PROBABLE AND THE PROVABLE (1977) (for a selection of critiques of L. Cohen's general analysis, see Open Peer Commentary to L. Cohen, *Can Human Irrationality be Experimentally Demonstrated*, 4 BEHAVIORAL AND BRAIN SCIENCES 317, 331 (1981)); *see also* Ronald J. Allen, *A Reconceptualization of Civil Trials*, 66 B.U. L. REV. 401 (1986) [hereinafter *Reconceptualization*]; Ronald J. Allen, *The Nature of Juridical Proof*, 13 CARDOZO L. REV. 373 (1991) [hereinafter *Juridical Proof*].

stochastically independent (a simplifying but not necessary assumption), the probability of both being true is .6 x .6 = .36. That means in turn that there is a 1.0 - .36 = .64 probability that at least one is false. If the assessments of probability are accurate, then in a large set of similar cases, approximately 64% of the time, defendants will not have committed the acts necessary for liability, and returning verdicts for plaintiffs will result in correct results 36% of the time and incorrect results 64% of the time. To generalize, returning a verdict for plaintiffs when it is more likely that defendants deserve to win will not optimize utilities or errors; one will expect to make, and probably will make, many more errors against deserving defendants than against deserving plaintiffs, and the expected number of total errors, and probably the actual number of errors, would be reduced by applying a different rule: to-wit that the fact finder should base its decision on the probability of the conjunction of all the necessary elements.

So there seems to be a paradox here, and it has captured the attention of numerous scholars. It prompted one distinguished philosopher to create an entirely new mathematics of induction in an effort to resolve the paradox,[7] an effort that ultimately foundered on the apparently inescapable fact that errors accumulate as a function of errors on discrete elements in his system as they do within conventional probabilistic approaches.[8] It has led another distinguished scholar essentially to give up explaining the paradox presumably on the ground that it will affect any logical approach to the problem.[9]

[7] COHEN, *supra* note 6.
[8] *See Reconceptualization*, *supra* note 6, at 418-19.
[9] D.H. Kaye, *Two Theories of the Civil Burden of Persuasion*, 2 LAW, PROBABILITY AND RISK 1 (2003) (conjunction is "as much a problem for the equal-error theory as for the standard theory. . .").

Nonetheless, academics have not been deterred. Recently two distinguished scholars have attempted to explain away the proof paradoxes. Saul Levmore thinks the answer lies in either the Condorcet Jury Theorem or in the implications of supermajority voting.[10] Alex Stein thinks the answer emerges from uncovering the economic implications of trials.[11] While both articles are rich and interesting for various reasons, neither provides a satisfactory theoretical account of the proof paradoxes, and for similar reasons. First, both make a series of *ad hoc* adjustments to their own arguments that are out of place in formal reasoning, again undermining the attempt to employ algorithms to explain the phenomenon under examination. Second, both articles mismodel the system of litigation they are trying to explain; and when necessary corrections are made to the model, neither of their formal arguments maps onto the reality of trials, leaving the original problem untouched and unexplained.

We explore these issues in this article. We begin with a brief examination of whether there is a proof paradox to explain. A number of scholars have asserted that perhaps there is not, and Levmore takes an ambiguous position on the question. As we show in Part II, there is no ambiguity about the law, and the law as conventionally understood involves an apparent paradox. In Parts III and IV, we demonstrate that Levmore's and Stein's explanations do not resolve the paradox. While we think that the proof paradoxes may not be explained away in the manner that Levmore and Stein attempt to do so, we do think they can be explained and part of that explanation is why the paradoxes are not pernicious. In Part V we provide that explanation. That explanation, in turn, may be

[10] Saul Levmore, *Conjunction and Aggregation*, 99 MICH. L. REV. 723, 723 (2001).
[11] Alex Stein, *Of Two Wrongs That Make a Right: Two Paradoxes of the Evidence Law and Their Combined Economic Justification*, 79 TEX. L. REV. 1199 (2001).

evidence that the common impulse among legal academics to search for the theory or algorithm that explains some slice of the legal landscape may be unavailing in some instances, and that instead knowledge more likely may be advanced by searching for and testing substantive explanations of complex phenomena that may not be reducible to relatively simple algorithmic form.

The bearing of this inquiry on the general topic of "visions of rationality" is plain. Rationality requires, at a minimum, sensitivity to the intellectual tools brought to a task, of which algorithmic theoretical accounts are only one of many.[12] Another, somewhat neglected in legal scholarship, is substantive explanations of legal questions that take into account the surrounding legal landscape. As we will show, the theoretical efforts to domesticate the conjunction paradox fail, but a substantive explanation of it can be given that demonstrates the small likelihood of perverse consequences flowing from it. While we doubt that this demonstration will contribute directly to the survival of the species, we hope that it may contribute to a deeper understanding of legal phenomena.

II. IS THERE A CONJUNCTION PROBLEM?

Levmore notes that the legal practice appears at odds with probabilistic reasoning;[13] simple notions of probability require "multiplying the probabilities associated with several events or requirements" that comprise a legal claim in order to assess the likelihood of the truth of that claim, but "judges and lawyers seem otherwise inclined."[14] Levmore also notes that "courts and statutes might be explicit about the manner in which

[12] For an interesting discussion of similar issues from an epistemological perspective, see NICHOLAS RESCHER, COGNITIVE PRAGMATISM 3 (2001) (". . . the principal message of the book is that in matter of inquiry and cognition the interrelationship or practical and theoretical issues is both more intimate and more complex than theorists of knowledge generally recognize.").

[13] *See* Levmore, *supra* note 10, at 723.

[14] *Id*.

multiple requirements [of a legal claim] should be combined, but they are not."[15] Indeed, Levmore suggests that the legal system is "strangely ambiguous" in its instructions to juries on whether they must evaluate a claim based upon the probability of each element of the claim, or upon the conjunction of the elements of such a claim.[16] Levmore implies that the answer may depend upon the way in which a jury views its "ambiguous" instruction, and cites to the work of Dale Nance to that effect.[17] Levmore also reviews case reports in the Jury Verdict Weekly that he believes may possibly reflect this ambiguity. Still, in the end, he concludes that the paradox is probably real, and he proceeds on that basis.

Levmore's acceptance of the formal paradox is well taken. Essentially none of the material he or Nance cites to is plausibly ambiguous; and even if that is erroneous, only a little uncovering of related material eliminates any possible ambiguity. For example, to illustrate his point that at least some states are ambiguous in their treatment of the conjunction issue, Levmore cites to a Florida standard jury instruction, which reads:

> The issues for your determination on the claim of (claimant) against (defendant) are: whether defendant was negligent in (describe negligence); and, if so whether such negligence was a legal cause of injury sustained by (claimant). If the greater weight of the evidence does not support the claim of (claimant), then your verdict should be for defendant.[18]

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[15] *Id*.
[16] *Id*.
[17] *See id*. at n.1 (citing to Dale A. Nance, *A Comment on the Supposed Paradoxes of a Mathematical Interpretation of the Logic of Trials*, 66 B.U. L. REV. 947 (1986) [hereinafter *Supposed Paradoxes*]). Others have uncritically accepted Nance's argument without checking the data. *See, e.g.*, Richard D. Friedman, *"E" is for Eclectic: Multiple Perspectives on Evidence*, 87 VA. L. REV. 2029, 2041 (commenting that Nance's argument was persuasive). Nance, by contrast, has been far more circumspect about his own work, referring to his "own modest search of authorities." Dale A. Nance, *Naturalized Epistemology and the Critique of Evidence Theory*, 87 VA. L. REV. 1551, 1571 (2001) [hereinafter *Naturalized Epistemology*]. However, he does go on to say that "no significant legal research . . . has contradicted my conclusion." *Id*. at 1572. We present that contradicting data here.
[18] Levmore, *supra* note 10, at n.1 (citing to Florida Standard Jury Instructions: Civil, *Negligence* § 3.5 at 1(c) – 2, 3.6, 3.7).

Levmore suggests that this instruction is ambiguous, although he also thinks that Florida law "appears" to require proof of each element rather than the conjunction.[19] In fact, there is no question under Florida law that this instruction merely defines the burden of persuasion and does not determine its extension. In an unbroken line of cases, the Florida courts have consistently asserted that the proper standard in civil cases is that plaintiffs must prove each essential element of the claim.[20] Indeed, the point is so obvious that the Florida courts have remarked, "No recitation of authority is necessary for the proposition that the burden of proof is on the plaintiff to establish by a preponderance of the evidence *each element of his cause of action*."[21] There is not a single case in Florida that we could find that speaks to proving the conjunction of the essential elements. We agree that all language contains ambiguity, but there is not very much of it here.

As Levmore indicates, Prof. Dale Nance has also noted possible ambiguity in jury instructions.[22] Nance cites a federal pattern jury instruction to demonstrate his point:

> The burden is on the plaintiff in a civil action, such as this, to prove every essential element of his claim by a preponderance of the evidence. If the proof should fail to establish any essential element of plaintiff's claim by preponderance of the evidence in the case, the jury should find for the defendant.[23]

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[19] *Id*.

[20] *See, e.g*., *McNeill v. Pinellas County Sch. Bd.*, 678 So.2d 476, 477 (Fla. Dist. Ct. App. 1996) (court requires School Board to prove each element of the charged offense by a preponderance of the evidence); *De Mandoza v. Bd. of County Commissioners*, 221 So.2d 797, 799 (Fla. Dist. Ct. App. 1969) (Court states that plaintiff claiming personal injury "must prove each essential element of his claim in order to be entitled to a verdict.").

[21] *Greenfield Real Estate Inv. Corp. v. Merritt*, 348 So.2d 1199, 1201 (Fla. Dist. Ct. App. 1977) (citing *Sharp v. Long*, 283 So.2d 567, 568 (Fla. Dist. Ct. App. 1973)) (emphasis added).

[22] Levmore, *supra* note 10, at n.1. In particular, Levmore cites to *Reconceptualization*, *supra* note 6, and *Supposed Paradoxes*, *supra* note 17, to demonstrate varying viewpoints on the law's ambiguity and on the correct approach to multiple element claims.

[23] *Supposed Paradoxes*, *supra* note 17, at 949 (citing E. DEVITT & C. BLACKMAR, FEDERAL JURY PRACTICE AND INSTRUCTIONS § 71.14 (3d ed. 1977)).

Nance notes the ambiguity presented in the phrase "*every* essential element of his claim" in that "every" might mean "all" or it might mean "each."[24] Consequently, Nance suggests that we ought to "consider such instructions skeptically, at least when considering which underlying theory of probability they confirm."[25]

Certainly, "every" could mean "all" or "each," but any ambiguity in the first sentence of the instruction is clarified by the second: "If the proof should fail to establish *any essential element* of plaintiff's claim by preponderance of the evidence in the case, the jury should find for the defendant." Plainly, the phrase "*any* essential element," (despite any ambiguity caused by the term "every" in the previous sentence), requires serial consideration of the elements against the standard of proof. Still, Nance argues that the second sentence in the above instruction is consistent with the idea that a plaintiff's claim, as a whole, must be proved by a preponderance of the evidence before the plaintiff can win his case,[26] and suggests that perhaps the purpose of the second sentence is simply "to remind the jury that a failure by the plaintiff to sufficiently prove any element of the plaintiff's case will relieve the jury of further deliberations on the other elements."[27]

Consistency is not very helpful in understanding the meaning of this language; requiring proof of each element is consistent with an infinite number of propositions that are themselves inconsistent with each other (such as the requirement that the probability of the conjunction of the elements be greater than, less than, or equal to the square root of .64, to pick a set at random). More telling, the second sentence contains no indication that it does not mean just what it says. There is literally no indication in this instruction

[24] *Id*.
[25] *Id*. at 950.
[26] *Id*.
[27] *Id*.

that it is meant to single out any one of the infinite propositions with which it is consistent and bestow upon that proposition its imprimatur.

At any rate, other instructions in the Devitt and Blackmar pattern jury set clarify the meaning of Nance's general one. For instance, an instruction concerning an action for fraud and deceit states:

> Plaintiff's claim against the defendant has six essential elements, as follows:
>
> First, that the defendant represented to the plaintiff that (here set forth the alleged representation);
>
> Second, that the representation was false;
>
> Third, (that the representation was known by the defendant to be false when it was made) (that the defendant made the representation recklessly and without regard to its truth or falsity) (that defendant told the plaintiff that it had knowledge that the representation was true, while not having such knowledge);
>
> Fourth, that the plaintiff relied on the representation and was deceived by it;
>
> Fifth, that the plaintiff acted with ordinary prudence in relying on the representation; and
>
> Sixth, that the false representation was the proximate cause of injury to the plaintiff.
>
> If you find that the plaintiff has established *each of these elements* by a preponderance of the evidence, then you should return a verdict for the plaintiff. . . .[28]

In short, the Devitt and Blackmar instructions mandate proof of each essential element. So, too, do other federal pattern jury instructions. For example, a recent version of the model federal jury instructions states:

> This is a civil case and as such the plaintiff has the burden of proving the material allegations of his complaint (*e.g.,* by a fair preponderance of the evidence). . . . If after considering all of the testimony you are satisfied

[28] E. DEVITT, C. BLACKMAR & M. WOLF, FEDERAL JURY PRACTICE AND INSTRUCTIONS § 83.02 (4th ed. 1987).

> that the plaintiff *has carried his burden on each essential point* as to which he has the burden of proof, then you must find for the plaintiff on his claims.[29]

More important than simply the pattern jury instructions themselves, the federal courts actually use such instructions in practice, and thus purport to require serial consideration of elements in a claim.[30]

The states are in accord with federal practice. For example, in California, the Rules of Evidence state explicitly that the party who has the burden of proof has that burden "as to each fact the existence or nonexistence of which is essential to the claim for relief or defense that he is asserting."[31] California case law accordingly requires that the ". . . jurors must concur that each element of a cause of action has been proved by a preponderance of the evidence" in order for a plaintiff to win.[32] Similarly, Illinois Pattern Jury Instructions provide:

> The plaintiff has the burden of proving each of the following propositions: First, that the defendant acted or failed to act . . .; second, that [the plaintiff was injured] [and] [the plaintiff's property was damaged]; third, that the

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[29] Modern Federal Jury Instructions: Civil, *Burden of Proof* § 73.01 (Matthew Bender & Co. 2002), *available at* LEXIS, Nexis Library, MOFJI File.

[30] Several federal courts have used and approved of this jury instruction or a similar instruction that requires proof of each element of a claim by a preponderance of the evidence. *See*, *e.g.*, *Peyton v. DiMario*, 287 F.3d 1121, 1124 (D.C. Cir. 2002) ("The jury returned a unanimous verdict finding that Peyton proved, by a preponderance of the evidence, each element of her claim of sex discrimination. . . ."); *Wolf Creek Collieries v. OWCP*, 298 F.3d 511, 520 (6th Cir. 2002) ("Claimants must prove each element by a preponderance of the evidence," citing *Adams v. OWCP,* 886 F.2d 818, 820 (6th Cir.1989)); *Aetna Cas. & Sur. Co. v. Pendleton Detectives of Miss., Inc.*, 182 F.3d 376, 378 (5th Cir. 1999) ("To prove negligence, 'a plaintiff must prove by a preponderance of the evidence each element of negligence: duty, breach of duty, proximate causation, and injury,'" quoting *Lovett v. Bradford,* 676 So.2d 893, 896 (Miss. 1996)); *Ressler v. White*, 968 F.2d 1478, 1479 (2nd Cir. 1992) (per curium) ("[The Jury] instruction correctly stated that the plaintiffs had the burden to establish by a preponderance of the evidence each element of the claim. . . .").

[31] CA. R. EVID. 500.

[32] *Valentine v. Baxter Healthcare Corp.*, 81 Cal. Rptr. 2d 252, 265 (Cal. Dist. Ct. App. 1999) (citing *Stoner v. Williams*, 54 Cal. Rptr. 2d 243, 252 (Cal. Dist. Ct. App. 1996)); *see also Smith v. Santa Rosa Police Dept*., 119 Cal. Rptr. 2d 72, 89 (Cal. Dist. Ct. App. 2002) ("ultimate burden of proof . . . rests with the plaintiff to prove each of the relevant facts supporting its cause of action") (internal quotation marks and citation omitted); *Harris v. Rudin, Richman & Appel*, 116 Cal. Rptr. 2d 552, n.25 (Cal. Dist. Ct. App. 2002) ("a plaintiff seeking summary judgment must prove each element of the cause of action. . . .").

> negligence of the defendant was a proximate cause [of the injury]. . . . If you find from your considerations of all the evidence that *each of these propositions* has been proved, then your verdict should be for the plaintiff.[33]

Finally, a Massachusetts jury instruction on the Burden of Proof states:

> This as you know has been the trial of a civil case. We begin each civil case with the proposition that the plaintiff, the party who is seeking to recover damages from the other, has the burden of proving *each essential element* of his or her case by a fair preponderance of the evidence.[34]

While we did not obtain every jury instruction from every state, we did not come across a single instruction that plausibly could be interpreted to require the finding of the conjunction of the elements rather than each element serially, leaving the conjunction paradox intact as a formal matter.

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[33] Illinois Pattern Jury Instructions: Civil, *Burden of Proof – Negligence* § 21.02 (West 2000).

[34] Massachusetts Jury Instructions, Civil, *Burden of Proof* § 1.14(D), LEXIS, Nexis Library, MACVJI File. Although ostensibly concluding that the conjunction paradox generally exists, and proceeding on that basis, Levmore cites to two further jury instructions that he thinks at least ambiguous about the matter. Levmore, *supra* note 10, at n.41. The first instruction, a Michigan instruction, states: "The plaintiff has the burden of proof on *each of the following propositions*: a. that the plaintiff [was injured/sustained damage]; b. that the defendant was negligent in one or more of the ways claimed by the plaintiff, as stated to you in these instructions; c. that the negligence of the defendant was a proximate cause of the [injuries/damages] to the plaintiff." Mich. Std. Civ. Jury Instructions § 16.02 (1988) (emphasis added). The phrase "on each of the following propositions" seems to us not ambiguous at all, as it clearly requires serial consideration of the elements of the claim. The Michigan judiciary agrees, s*ee Kelly v. Builders Square, Inc.*, 632 N.W.2d 912, 918 (Mich. 2001) ("Plaintiff had the burden to prove *each element* of her case.") (emphasis added).

Levmore also cites to a New Hampshire instruction: "The plaintiff claims: [State essential elements of the claim, making reference to time, place and circumstances] . . . These are the issues which are to be determined by you based on the facts as you find them to be and by applying the law as the court instructs you." Levmore, *supra* note 10, at n.41 (citing N.H. Civ. Jury Instructions § 1.1 (1999)). This was the one jurisdiction that any skeptic about the existence of the formal conjunction paradox has raised in which we could not definitely establish its presence. New Hampshire seems to be an anomaly as its courts apparently have no preference on whether juries ought to be instructed that a plaintiff has the burden of proof on "all" versus "each" of the elements. *See Sayers v. Ralston Tree Serv., Inc.,* 189 A.2d 480, 488 (N.H. 1963) ("The argument that the Trial Court erred in its instruction to the effect that the jury must find that the plaintiff had proved 'all of the elements' . . . instead of charging that the jury must find that he had proved 'each element' . . ., requires no discussion."). It seems that the New Hampshire courts equate the term "all" with "each" or vice versa. As long as the "instructions given embody the law applicable to the case," *Brown v. Gottesman*, 165 A.2d 43, 46 (N.H. 1960), New Hampshire courts have, apparently, little else to say about the burden of persuasion.

But, perhaps the facts on the ground differ from the formal requirements of the law. Although he ultimately rejects the idea, Levmore raises the possibility that perhaps most cases really do involve single formal elements.[35] After reviewing a random sample of jury verdicts in Jury Verdicts Weekly, he concluded that 20% of the cases involved one issue,[36] 30% involved "two or more independent, contested elements," and in the remaining 50%, it was not clear whether the jury was deciding "one issue or more."[37]

We reviewed the same Jury Verdicts Weekly and examined every case in the summary published from January to March of 1996, which is the period from which Levmore took his random sample. Examining every case result clarifies that multiple formal elements are typically litigated.[38] At the very most, only 8% of the total number of cases reported (including those that were settled) could possibly have involved single issues.[39] We counted single issue cases as those which, in their story-like descriptions, contained phrases (in bold print) such as, "**negligence admitted**," which suggests that causation was the only contested element. However, it is not clear that even these "bold print" cases literally involved single issues as some cases imply that damages were contested.[40] While in general the rest of the case summaries did not list or make easily

[35] Levmore, *supra* note 10, at 746-48.
[36] *Id*. (discussing Jury Verdict's Weekly (Jan.-Mar. 1996)).
[37] *Id*.
[38] *See id*. To say that elements are litigated is merely to say they are not conceded. The actual factual dispute at trial may be over a very small range of evidence or facts but still range over multiple formal elements. *See infra*, Part V.
[39] *See* Jury Verdict's Weekly (Jan.-Mar. 1996).
[40] *Id*. In most, if not all of these bold print cases, damages were also disputed. In any event, these bold print cases were counted as single issue cases along with any other case (not bearing bold print) that could possibly be identified as presenting only one issue to the jury. The resultant number was 40 single issue cases, which is approximately 8% of the total number of cases.

identifiable the precise number of elements involved in each specific claim,[41] they provided descriptions of the cases, such as the following:

> 1) *Auto Collision*: "Plaintiff contended that she was on a dark stretch of the highway with two vehicles boxing her in; that the lead car slammed on its brakes . . . defendant was at fault in rear-ending plaintiff's vehicle.[42]
>
> 2) *Wrongful Termination*: "Plaintiff contended that defendant breached the implied contract of employment by eliminating his position due to his age and physical handicap."[43]

Plainly, these summaries describe legal claims that involve more than one element, and there is no indication (via bold print or anything else) in the case descriptions that anything went uncontested. Consequently, as Levmore in the end concludes, the number of single-issue cases is apparently quite small, and conjunction remains problematic.[44]

III. THE CONDORCET JURY THEOREM, SUPERMAJORITY VOTING RULES, AND THE CONJUCTION PROBLEM

Levmore identifies "an interesting connection between our practices with respect to aggregation and conjunction"[45] that may provide a way out of the thicket of the apparent paradoxes. His article is wide ranging, but our concern is with only one aspect of it, although it is an important aspect. In particular, he "advances the idea that the process of aggregating multiple jurors' assessments hides valuable information."[46] Levmore first argues that because "the Condorcet Jury Theorem indicates that agreement among multiple jurors might raise our level of confidence in a particular determination beyond what the jurors themselves individually report,"[47] it may help to explain the law's

[41] *See id*.
[42] *Id*. at Jan. 26, 1996, *Elias v. Ryan*.
[43] *Id*. at Feb. 23, 1996, *Perry v. Pac. Gas & Elec. Co.*
[44] In Part V, we explain why quite likely conjunction is not perverse.
[45] Levmore, *supra* note 10, at 734.
[46] *Id*. at 723.
[47] *Id*. at 723-24.

"disinclination to instruct factfinders according to [the] basic rule of probability."[48] He next argues that supermajority voting rules may not only complement the Condorcet Jury Theorem ("CJT"), but perhaps further explain why the law's suppression of the product rule is not as problematic as it seems.[49] As we develop in this section, neither the CJT nor supermajority voting rules can explain the law's disinclination toward applying the product rule, and thus, the conjunction problem, despite Levmore's efforts, remains. In addition, Levmore's argument neglects that many trials are bench trials before single decision makers, and his argument has other curious attributes as well.

[48] *Id.* at 737. As Paul H. Edelman has pointed out, *On Legal Interpretations of the Condorcet Jury Theorem*, 31 J. LEGAL STUD. 327, 347 (2002), one must specify a probability model in order to interpret the truth of jury results under the Condorcet Theorem. Although Levmore does not specify his model, he obviously employs an aggregation of information model (that permits statements to be made about the truth of legal fact findings), rather than a "randomness" or "polling" model. The randomness model is plainly inappropriate in a jury setting, but Edelman concludes that the polling model, rather than the aggregation of information model employed by Levmore, is the more accurate description of jury decision making. *Id*. at 347. The polling model describes juries as bodies of randomly chosen members whose majority vote "will approach with probability 1 the result of a majority vote among all possible voters," *id.* at 332, and "does not depend on any particular knowledge of the jury," *id*. at 347. Edelman makes a persuasive case, which if accepted, as he develops in detail, demonstrates that Levmore's arguments are in error. Nonetheless, Levmore is not making claims about legal decision makers accurately deciding what the population at large would decide; he is making claims about the truth of the facts found by legal decision makers, and we are working within that constraint.

Edelman rejects the "aggregation of prior information" model on the ground that it is not "reasonable to view a juror as an expert who has some a priori information about the issues at hand," and that it "strains credulity" "to think of [jurors] as 'experts' with a prior track record on evaluating legal matters." *Id*. at 346. Edelman is thinking here of a panel of medical experts called to issue an opinion about some matter within their expertise, and surely jurors do not look like that. However, there is a sense in which juries are inference machines that do entail a form of aggregation of prior information. In particular, the knowledge and experience of the individual jurors is necessary to evaluating, explaining, and understanding the evidence, and is brought to the surface through both individual assessments of evidence and deliberation with other jurors. *See* Ronald J. Allen, *Factual Ambiguity and a Theory of Evidence*, 88 NW. U. L. REV. 604 (1994) [hereinafter *Factual Ambiguity*]. Although some reference to jurors' background knowledge is required to make sense of juridical evidence, nonetheless, as discussed in *Factual Ambiguity*, *supra*, at 627-29, the rules of evidence intrude to reduce the extent to which one could accurately analogize a lay jury to a group of experts. In any event, as we demonstrate in the remainder of this article, no matter what model is adopted, the Condorcet Jury Theorem simply does not map onto the structure of modern day juries.

[49] Levmore, *supra* note 10, at 739-45.

A. The Condorcet Jury Theorem and Conjunction

Condorcet's Jury Theorem[50] proves that if the probable truth of an enlightened voter's opinion is greater than one-half when choosing between one of two alternatives, then the larger the group of such voters, the greater the probability that a majority decision will be "true."[51] Levmore derives from the CJT the following argument:

> If every juror reacts to evidence of defendant's negligence with an individual assessment that this is .6 likely, it seems plausible if not certain that this jury would report a unanimous .6 assessment (if asked for a number). But we would know (by the way of the Jury Theorem) that these well-meaning jurors failed to appreciate the combined power of their assessments. Had we asked each whether the assessment of negligence should be .6 or more, all would have responded affirmatively, and it is reasonable to think that every juror is more likely than not to get this question right. If each juror thinks that .6 is a good assessment of the first requirement, and .7 is a good assessment of the second, the large jury's overall chance of being right, as to the questions of negligence (or not) and causation (or not), may be quite high with respect to each question. The product rule is still correct, to be sure, but the product rule yields a number almost surely closer to 1.0 than to .42.[52]

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[50] The Condorcet Jury Theorem ("CJT") was promulgated by the Marquis de Condorcet in 1785 in his *Essai sur l'application de l'analyse à la probailité des decisions rendues à la pluralité de voix* [hereinafter *Essai*] *translated in* CONDORCET: SELECTED WRITINGS 33 (Keith Michael Baker ed., 1976) [hereinafter SELECTED WRITINGS]. Although the theory originally focused upon jury decisions involving the death penalty, Condorcet soon turned his attention toward decisions made by political assemblies. Cheryl D. Block, *Truth and Probability – Ironies in the Evolution of Social Choice Theory*, 76 WASH. U. L. Q. 975, 1003 (1998). The *Essai* embodies Condorcet's attempt to combine mathematics with the social sciences, to investigate the logic of public participation in politics (after the French Revolution), and to lay the mathematical groundwork for a system of representative institutions that could guarantee "truth" in decision-making. Keith Michael Baker, CONDORCET: FROM NATURAL PHILOSOPHY TO SOCIAL MATHEMATICS 228-29 (The Univ. of Chicago 1975) [hereinafter CONDORCET]. The purpose of Condorcet's *Essai* was to apply mathematical reasoning to what he saw as the "problem of political obligation in the context of representative institutions." *Id*. at 229. Condorcet was concerned with subjecting represented citizens to laws that were not unanimously voted upon, or to decisions that were against their individual interests. *Id*. Thus, the thrust of Condorcet's *Essai* was to determine the conditions under which the probability of the truth of a majority decision, (made by an assembly or a tribunal), would be high enough to justify compulsory acceptance of that decision by the rest of society. *Id*. at 228.

[51] CONDORCET, *supra* note 50, at 236. It is important to note that, for purposes of this discussion, "true" should be interpreted as "correct." However, for Condorcet, "true" did not exactly mean "correct," as he believed that all truth was a matter of probability and that there was never any absolute certainty in decision-making. *Id*. at 237. Thus, he defined a "true" decision simply as one made by a truly enlightened man. *Id*.

[52] Levmore, *supra* note 10, at 736.

This argument is inconsistent with the assumptions of the Condorcet Jury Theorem, and is, thus, formally flawed. Moreover, the argument fails to account for the reality of jury trials in various ways.

1. Failing to Account for the Essential Assumptions of the CJT

Under the version of the Condorcet Jury Theorem employed by Levmore, each of the following conditions must be met in order for the Theorem to operate successfully:

(1) Groups must be made up of equally enlightened voters each bearing a probability of greater than one-half of reaching a true decision;[53]

(2) Group members must express their opinions in good faith;[54]

(3) Group members must not "influence" one another's decision;[55]

[53] *Essai*, *supra* note 50, at 48-49; *see also* CONDORCET, *supra* note 50, at 235-36. If the probable truth of each voter's opinion is less than one-half (which should only happen in situations where a voter's prejudice or self-interest affects his judgment), the majority decision of such a group will most likely be erroneous. *Essai*, *supra* note 50, at 49 (the probability of an erroneous decision increases as the number of persons in such a group increases). Where the probable truth of each voter's opinion is merely one-half, the truth of the majority decision of such voters is also one-half. *Id*. (such is the case no matter what the number of individuals voting).

Condorcet only addresses the case in which the probable truth of each voter's opinion is exactly the same; he does not apply his Theorem to heterogeneous groups. *See generally id*. However, the CJT may still operate when a voting group is comprised of individuals whose probable truth of opinion vary, as long as the group is sufficiently large and the "average competence" of the group is "greater than the fraction of votes needed for passage." *See*, *e.g.*, Mark Fey, *A Note on the Condorcet Jury Theorem with Supermajority Voting Rules* 1, 6 (July 2001) *forthcoming in* SOC. CHOICE AND WELFARE. Nonetheless, the probability of the truth of a majority decision is severely undercut (and so is Condorcet's Theorem) when the probable truth of some voters' opinions are less than one-half or equal to one-half. *See Essai*, *supra* note 50, at 49-51; *see also* Jacob Paroush, *Stay Away From Fair Coins: A Condorcet Jury Theorem*, 1998 SOC. CHOICE AND WELFARE 15, 19 (1998) (the votes of individuals whose probable truth of opinion is close to one-half are essentially meaningless as such votes only "introduce 'noise' to any social choice.").

[54] *Essai*, *supra* note 50, at 47; *see also* CONDORCET, *supra* note 50, at 235.

[55] *Essai*, *supra* note 50, at 47; *see also* CONDORCET, *supra* note 50, at 235. Although independence can be relaxed, we put dependence aside as it simply complicates matters needlessly. The mathematics becomes considerably more complex, requires knowledge of the dependency, and involves some counterintuitive conditions (such as ignorance can increase the probability of a correct outcome). While it is not impossible that a version of the Condorcet Theorem incorporating dependence would explain jury decision-making, it is highly implausible, and in any event would be virtually impossible to verify. *See* Krishna K. Ladha, *The Condorcet Jury Theorem, Free Speech, and Correlated Votes*, 36 AMER. J. POL. SCI. 617 (1992); *see also* Bernard N. Grofman, Guillermo Owen, & Scott L. Feld, *Thirteen Theorems in Search of the Truth*, 15 THEORY & DECISION 261 (1983). Levmore does not discuss independence, but he is obviously relying on the original version of the Condorcet Theorem, which requires independence. *See, e.g.*, Levmore, *supra* note 10, at 735, n.23 (Levmore employs a standard model here).

(4) Complex decisions (or decisions in which there are more than two ways of casting a vote) are broken into a series of simple (binary) propositions, each of which are voted upon.[56]

Condorcet was attempting to justify the decision making of various groups, such as juries and legislative assemblies.[57] Although the concerns here are the formal aspects and setting of modern jury trials rather than the sociology of who is "enlightened,"[58] nonetheless the differences between French assemblies and modern day jury trials should immediately raise a concern about the applicability of Condorcet's Theorem. For Condorcet, an "enlightened" voter had all information necessary to make a reasoned and informed decision.[59] As Condorcet put it: "[Voters] should not be deprived of the means of forming an opinion," and should be able to "enlighten themselves on the grounds and the consequences of the decision proposed to them."[60] This plainly does not describe a trial where both party control of the evidence and the rules of evidence themselves repeatedly remove certain information from the jury's consideration.[61] Moreover, jurors are universally instructed not to conduct an independent investigation or to gather any

[56] *Essai*, *supra* note 50, at 50; *see also* CONDORCET, *supra* note 50, at 237.
[57] *Essai*, *supra* note 50, at 48-49.
[58] *See id*., at 47, 49-50. Condorcet's "enlightened" individual was one who was highly educated as Condorcet believed education promoted reasoned and illuminate thinking – two important factors when it came to establishing truth in decision-making. *See generally* Marquis de Condorcet, *On the Nature of Public Instruction* (1791) [hereinafter *Public Instruction*] *translated in* SELECTED WRITINGS, *supra* note 50, at 105. In fact, in his biography of Turgot, Condorcet wrote, "[it] is easy to establish assemblies; but their utility depends entirely upon the education of their members and the intelligence that inspires them. . . ." CONDORCET, *supra* note 50, at 292.
[59] In a later work, *On the Principles of the Constitutional Plan Presented to the National Assembly*, Condorcet notes that an enlightened voter is one who is informed on the question, or rather one who has "match[ed] to his enlightenment and powers of intelligence the study he is obliged to make of a question." *On the Principles of the Constitutional Plan Presented to the National Assembly* (1793) [hereinafter *Constitutional Plan*] *translated in* SELECTED WRITINGS, *supra* note 50, at 143, 149.
[60] *Id*. at 159. This statement also has consequences for juries in criminal trials; such juries are often instructed not to consider the subject of penalty or punishment during deliberation. *See, e.g.,* California Jury Instructions: Criminal, *Jury Must Not Consider Penalty – Non-Capital Cases* § 17.42, LEXIS, Nexis Library, CALJIC file.
[61] For example, rules against admitting hearsay or against admitting privileged information keep vital information from jurors, and thus, keep them from being fully informed.

information from a source outside the trial.[62] This is the exact opposite of the conditions Condorcet was theorizing about. Similarly, one of the central concerns of the rules of evidence – the unfair prejudicing of jurors by information – captures again virtually the exact opposite of the decision maker Condorcet had in mind – a decision maker who would be informed, not prejudiced, by information. Once we lose Condorcet's enlightened (informed) voters, we have lost the assurance that, by way of the CJT, a jury's overall decision is probably right.

These differences between decision makers in Jacobin France and modern jurors highlight the formal flaws in Levmore's argument. Modern jurors are not picked because they are enlightened, and certainly not because there is a greater than .5 probability that each juror will independently reach the correct result. Nor are they charged to enlighten themselves and then vote according to their conscience. Quite the contrary, the necessary conditions of the Condorcet Theorem are systematically ground out of the process. Modern jury trials explicitly involve a collective decision that can only be reached, in either direction, with a supermajority vote, and in which deference and compromise are encouraged as part of an intensively collaborative effort. Juries are instructed to "listen with deference to the views of others,"[63] to attempt to "resolve [ ] differences and come to a common conclusion,"[64] and to "deliberate with a view to reaching an agreement."[65]

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[62] *See, e.g.,* California Jury Instructions: Civil, *Pre-Trial Admonition* § .50, LEXIS, Nexis Library, BAJI File; Florida Standard Jury Instructions in Civil Cases, *Preliminary Instruction* § 1.1, LEXIS, Nexis Library, FLJINS File.

[63] California Jury Instructions: Civil, *Deadlocked Jury Admonition* § 15.60, LEXIS, Nexis Library, BAJI File.

[64] Florida Standard Jury Instructions in Civil Cases, *Jury Deadlocked* § 7.3, LEXIS, Nexis Library, FLJINS File.

[65] Illinois Pattern Jury Instructions: Civil, *Deadlocked Jury* § 1.05 (West 2000); *see also* New York Pattern Jury Instructions, *Conclusion* §1:28, *available on* Westlaw database NY-PJI.

These instructions directly contradict the Condorcet requirement of independence.[66] Obviously, the probable truth of a juror's vote is not independent of another juror's vote if he defers to the opinions of others or actively searches for consensus. Indeed, merely limiting the jurors to observing the same evidence will undermine independence.[67] Moreover, the super-majority decision rule applicable to juries requires negotiation and compromise that may take a jury away from the decision that a majority, voting independently, might have reached, which again simply contradicts the assumptions underlying the CJT. Consequently, the CJT is not applicable to jury decision making, and there is no reason, so far as the CJT is concerned, to think that even a large jury will be more likely than not to make a "true" decision. Thus, the conjunction problem remains and the CJT fails to explain the law's suppression of the troublesome product rule.

In a subsequent article, Levmore notes that Jury Theorem "purists" allow no room for deliberation, implying that the Theorem still has some traction for those willing to be a little less particular about its formal requirements.[68] This remark captures nicely our disquietude with Levmore' argument, for "purity" is not a measure of how algorithms are used; rather, they either apply or do not apply, or are applied correctly or incorrectly. In any event, deliberation is not the problem,[69] lack of independence is. For Condorcet, "deliberation" was a tool to clarify the issues so that they may be clearly and definitively

[66] *See Essai*, *supra* note 50, at 47; *see also* CONDORCET, *supra* note 50, at 235.
[67] Ladha, *supra* note 55, at 623 ("Clearly, the votes of real-life jurors *will be* correlated because the jurors hear the same evidence presented by various witnesses, the public prosecutor, and the defense attorney.").
[68] Saul Levmore, *Ruling Majorities and Reasoning Pluralities*, 3 THEORETICAL INQUIRIES L. 87, 90 (2002) [hereinafter *Ruling Majorities*].
[69] Although Condorcet's work on the Jury Theorem is not clear on the question of deliberation, his later work, *Constitutional Plan* set forth a system of deliberative assemblies designed according to the dictates of the CJT, and designed to rule France under the new constitutional regime. *See generally Constitutional Plan*, *supra* note 59.

presented as binary questions,[70] and was an aid in the process of self-enlightenment and reflection.[71] Nonetheless, if deliberation occurs, the probability that an individual votes for a "true" alternative must remain statistically independent of the same probability for another voter in order for the CJT to operate successfully.[72]

Although deliberation is not necessarily a problem under the CJT, Levmore's reason for arguing that it is not a problem is unconvincing and *ad hoc*. He asserts that deliberation may be useful for determining the truth of a Condorcet decision because "deliberation can serve to bring out 'expert' knowledge and assessments which (even) the Jury Theorem bows to."[73] Even if deliberation is able to bring out expert knowledge, Levmore has left the realm of the CJT. In order for the version of the Theorem that Levmore is relying on to operate correctly, the probability that each voter is right must exceed .5, and one voter cannot influence another's opinion,[74] yet, Levmore's argument assumes neither would be true if expertise were revealed. Jurors would not vote as they

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[70] *Id*. at 147-48.

[71] *Id.*; *see also* Block, *supra* note 50, at 1013-15. Again, although Condorcet does not discuss deliberation in his *Essai*, it is clear from his work in *Constitutional Plan* that deliberation should be enlightening. *Constitutional Plan*, *supra* note 59, at 148-49, 159 (even in deliberations rapidly undertaken, voters "should be able to enlighten themselves . . ."). In effect, an individual voter uses deliberation as a learning tool. *Id*. And, as Condorcet proposed in *Public Instruction*, all education ought to be purely instructive and constructive. *See generally Public Instruction*, *supra* note 58, at 105. Therefore, voting groups can deliberate and share information and opinions, but each member must then thoughtfully examine the view-points of others, reflect upon the issues, mesh new information with his own enlightened opinion, and come to his own individual conclusion. Condorcet stressed that opinions are not truth, and therefore should not be treated as such. *Id*. at 127. Instead, opinions should be subjected to examination, and discussions should be reflected upon; "the aim of education can no longer be to consecrate established opinions but, on the contrary, to subject them to free examination. . . ." *Id*. at 126.

[72] David Austen-Smith & Jeffrey S. Banks, *Information Aggregation, Rationality and the Condorcet Jury Theorem*, 90 AM. POLITICAL SCI. REV. 34, 38-39 (1996). If independence is relaxed, the informational barriers to applying the Condorcet Theorem to jury voting are insuperable. In any event, although Levmore does not carefully specify what exactly he means by the "Condorcet Theorem," he is employing a version of it with independence.

[73] Levmore, *supra* note 10, at n.51. In *Ruling Majorities* Levmore states, "deliberation has potential value on the Theorem's own terms," as it might "reveal the presence of expertise, in which case each voter is no longer to be regarded as equally likely to be right." *Ruling Majorities*, *supra* note 68, at 90.

[74] *Essai*, *supra* note 50, at 47-49; *see also* CONDORCET, *supra* note 50, at 235-36.

believe but rather as instructed by the newly revealed expert.[75] The *ad hoc* nature of the argument here is obvious. If deliberation is a problem, it is solved, *deus ex machina*, by the arrival of expertise.[76]

The invocation of expertise in this manner is implausible regardless of the dictates of the Condorcet Theorem. Just as jurors are not picked with the requirements of the Condorcet Theorem in mind, neither are they picked on the basis of their ability to spot expertise among them. For deference, as a result of identifying expertise, to guarantee correct outcomes, the jurors must identify it accurately, and there is no reason given to think that they do. In fact, we know of nothing in jury research literature to suggest that jurors even engage in such a decision making strategy with any regularity, if at all. And, the conjunction problem would still remain; in cases involving multiple elements (which includes nearly all cases), "experts," like everyone else, are instructed to decide upon the probability of each separate element. We are then right back to where we started – the conjunction paradox.

2. Misapplying the CJT and Mismodeling the System of Litigation

In addition to not accommodating the assumptions of the CJT, Levmore's specific argument that findings of two elements to a .6 and a .7 probability respectively combine to form a conjunction "almost surely closer to 1.0 than to .42" involves a misapplication of the Theorem and a mismodeling of the system of litigation. The first point has been

[75] *See* Ladha, *supra* note 55, at 631 (reducing robust competition among different ideas leaves votes meaningless).

[76] We refer in the text to "the version of the Condorcet Theorem" that Levmore is relying on. There are other versions, and they can indeed accommodate differing probabilities of voters being correct, among other things. However, the version most applicable to Levmore's invocation of expertise implies precisely the opposite of what he is arguing. In groups the size of juries, there are various circumstances in which the decision of the majority will be more probably true than the decision of the most competent member of the group. Grofman, Owen & Feld, *supra* note 55, at 272.

exhaustively analyzed previously,[77] and we will give only a single example of its consequences here. The CJT requires that decisions be broken into a series of binary propositions.[78] In a negligence case, the jury is asked something like, "Do you think negligence is established by a preponderance of the evidence? Do you think causation is established by a preponderance of the evidence?" The jurors respond yes or no, and the vote of a majority will result in an answer whose probability of truth approaches 1.0.[79] Applying the CJT to Levmore's example, where a majority has voted that the probability of negligence is .6 and that the probability of causation is .7, it is the truth of these probabilities – .6 and .7 – that approaches 1.0, and not, as Levmore suggests, the probabilities of the two variables themselves that approach 1.0.[80] And, if, as Levmore states, the product rule still applies, then the "true" assessment of .6 (for negligence) and the "true" assessment of .7 (for causation) combine to the form the probability of their conjunction being .42 (and not a number closer to 1.0).[81] The conjunction problem remains, and indeed is magnified by Levmore's own example.[82]

Perhaps the argument above does not fully engage with Levmore's position, which includes a curious psychological assumption that may blunt the force of our argument. Levmore's argument assumes that jurors' assessments of the probability of an element are equivalent to an assessment that their response sets the floor for the probability. Thus, he seems to equate "an individual assessment" that something is .6 likely with "the

[77] *See generally* Edelman, *supra* note 48.
[78] *Essai*, *supra* note 50, at 50; *see also* CONDORCET, *supra* note 50, at 237.
[79] *See* CONDORCET, *supra* note 50, at 236; *see also* Edelman, *supra* note 48, at 344.
[80] *Compare* CONDORCET, *supra* note 50, at 236 *and* Edelman, *supra* note 48, at 344-45 *with* Levmore, *supra* note 10, at 736.
[81] Levmore, *supra* note 10, at 736.
[82] As Edelman goes through carefully, other possible interpretations of Levmore's assertion fare no better.

assessment of negligence [as] .6 or more."[83] This helps his argument in one sense, but dramatizes its *ad hoc* nature in another. Equating these two gives some support for the proposition that the original juror assessment understates the strength of the evidence as perceived by these same jurors, but there is no reason given why these two should be equated. Jurors are not asked to determine the minimum probability. If anything, they are asked to determine the actual probability. If asked what the dispersion over that number might be, there is literally no reason to think it would only be toward 1.0. Empirical question though it is, it is much more reasonable to think that jurors would identify their own assessments as either accurate or, if pressed, as the median of the likely range, both of which would falsify Levmore's argument.

There is another problem. Take Levmore's argument at face value, a further "paradox" emerges. For the argument to be a general account of the insignificance of the conjunction paradox, it must be understood to mean that jury findings in which the probabilities of discrete elements exceed the preponderance standard will yield a probability of the conjunction closer to 1.0 than to the product of the two independent probabilities. In essence, he is asserting that the actual conjunction of two elements is higher than the mean of the range from the product of the two separate probabilities to 1.0, which explains why he asserts that the actual conjunction of two elements found to .6 and .7 respectively will be closer to 1.0 than .42. While this is plainly *ad hoc* undefended, still, if it is correct, the conjunction paradox is simply inverted, for it means that verdicts will be returned for plaintiffs only when the probability of the conjunction

[83] Levmore, *supra* note 10, at 736.

exceeds .625.[84] This is inconsistent with every justification for the proof rules of civil litigation of which we are aware. It means, for example, that errors probably will be made disproportionately against deserving plaintiffs (rather than against deserving defendants under the original paradox), and it means that expected utility will not be maximized. This is just another version of the same disease, the cure for which was thought to lie in the Condorcet Theorem.

It is also unclear why this argument should be limited to those elements for which individual assessments are greater than .5. As already pointed out, a juror who finds the probability to be, say, .6, can only be taken to mean precisely what is asserted, and not something else about the truth of the element in question. Under Levmore's argument, the actual conjunction of such assessments should be taken to be greater than the median of the range from the conjunction of the original assessments to 1.0, but this should be true regardless whether individual assessments of elements exceed .5. Probability in Levmore's conception is a continuous variable, and there is no reason why a finding of the probability of two elements to just a little more than .5 should yield a conjunction greater than .625, but a finding of the probability of the same two elements to .5 (which does not meet the preponderance standard) should all of a sudden yield a substantially lower conjunction.

Now consider the logical implications of this argument. Assume that the conjunction of the actual assessments of jurors is 0.0. The mid point of the range from 0.0 to 1.0 is .5. Under Levmore's argument, we should convert the 0.0 figure into a greater than .5

[84] If two elements are found to just slightly more than .5, then their product will be approximately .25; .625 is the mean of the range from .25 to 1.0.

finding, satisfying the burden of persuasion. This also means that plaintiffs always win, no matter what the proof is. An argument that leads to such results cannot be correct.

B. Supermajority Voting Rules and Conjunction

Levmore offers an additional "supermajority voting rules" theory to help rationalize the "math-law divide."[85] Levmore argues that, "When the majority of a group agrees that a given threshold (such as [preponderance of the evidence]) has been met, we can normally reason that the standard has been exceeded by a significant amount, especially where a supermajority voting requirement is utilized."[86] Accordingly, suppressing the product rule where supermajority voting applies is "often harmless."[87] Levmore offers the supermajority voting theory as both a complement to the CJT and as a potential "alternative" to the product rule, but like his argument concerning the CJT, his supermajority voting argument mismodels the system he is theorizing about and has hidden curious and problematic psychological assumptions.

Levmore argues that:

> When a supermajority of a reasonably sized jury responds affirmatively to the [preponderance of the evidence] questions it is asked to consider, we can guess that the median and mean of the entire jury are well above .5 for each question. This gives us reason to be fairly comfortable with a system that suppresses the product rule and asks only whether a supermajority believes the [preponderance of the evidence] has been met for each question. . .[88]

The example he gives is of 9 of 12 jurors who conclude that negligence and causation are more likely than not true:

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[85] In *Conjunction and Aggregation*, Professor Saul Levmore coined the phrase "math-law divide" to describe the obvious tension between legal practice and probabilistic reasoning. Levmore, *supra* note 10, at 723.
[86] *Id*. at 740.
[87] *Id*.
[88] *Id*. at 744.

> . . . [I]t is easy to imagine that each supermajority group of nine incorporated individual assessments ranging from just over .5 all the way to 1.0. . . . In the absence of additional information about the actual distribution, we might even proceed amateurishly and recklessly, and hazard a guess that the average assessment of this group of nine is .75, halfway between the marginal .51 vote and the ceiling offered by 1.0. If we apply the product rule, then .75 times .75 is about .56, exceeding the marker of the POE rule.[89]

The argument here is purely *ad hoc*. It specifies one of an infinite range of distributions to demonstrate that there is not a problem, but neglects all others in the range. The argument requires that the relevant range of probability be from the lowest assessment of those jurors voting for the plaintiff to 1.0 and that the "average assessment" of the entire group be the median of that range, but either could be false in any particular case. Consider, for example, a negligence case in which nine of twelve, or even twelve of twelve, jurors determine that the preponderance of the evidence standard has been minimally met as to negligence and causation, but who also believe the probability of negligence and the probability of causation each lie between .51 and .7.[90] Plainly, under this example, the conjunction problem remains. Levmore dismisses such cases as "unlikely." They do not appear unlikely to us, and more importantly he neglects to tell us how we know what is likely or unlikely about these matters.[91]

Taking his argument at face value uncovers yet another problem. Suppose that under supermajority voting the best estimate is that the mean assessment lies between the

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[89] *Id*. at 741.

[90] We are assuming here that it is sensible to directly apply to jury decision making the model of conventional probability Levmore is employing. If it is sensible, his argument suffers from the disabilities noted in the text. As we develop in Part V, *infra*, we doubt this way of looking at things in general is very helpful, informative, or accurate.

[91] Levmore, *supra* note 10, at 743. The example he gives is a bit more extreme than ours, and thus a bit more unlikely, but disposing of an extreme example as "unlikely" when it is just one of a numerous set of related, and considerably more likely, alternatives, does not dispose of the set from which the unlikely candidate is drawn.

lowest possible value and the ceiling of 1.0. Suppose further that the law is attempting to maximize expected value or correct results, so that verdicts should be returned for plaintiffs when the probability of their story as a whole exceeds .5 (which is the assumption Levmore is operating under). Now consider a case in which there is agreement that there is high probability of negligence, with the lower bound being, say, .9. That means, under Levmore's argument, that we should assume that the median assessment is .95 (half way between .9 and 1.0).[92] What finding must be made on causation in order to further the system's objectives? The answer is clear: Whatever value would result in the conjunction of the two elements exceeding .5, which is approximately .53 (.53 x .95 = .5035). Under Levmore's theory, to get a median of .53 requires agreement that the possible range contains .53 as its median. That range is from .06 to 1.0. Thus, if the jurors agree that the minimum possible probability of causation is .06, they should return a verdict for the plaintiff. To generalize, if errors or utilities are to be optimized, then jurors should be instructed to apply a sliding scale: If the probability of one element goes up, the probability necessary for a plaintiff's verdict on the other goes down. One sees no such thing in general, of course.[93] Thus, either the law is wrong

[92] One difficulty is that Levmore does not clearly specify his position, but we think the argument in the text is a fair, and indeed conservative, logical reconstruction. In discussing his argument, he says that if "the artificial device of the jury having reported its precise .51 breakpoint" is dropped, "our best estimate is undoubtedly higher than before. . ." *Id*. at 742.

[93] This is not to say that the law does not evolve in part because of proof issues. Some states now allow recovery for "lost chance" in torts. *See, e.g., Wendland v. Sparks*, 574 N.W.2d 327, 331 (Iowa 1998); *Perez v. Las Vegas Med. Ctr.*, 805 P.2d 589, 592 (Nev. 1991); *McKellips v. St. Francis Hosp., Inc.* 741 P.2d 467, 476 (Okla. 1987); *Jorgenson v. Vener*, 616 N.W.2d 366, 371 (S.D. 2000); *Herskovits v. Group Health Coop. of Puget Sound*, 664 P.2d 466, 467 (Wash. 1998). This can be viewed as an attenuation of the causation requirement in the face of good evidence of breach. Nonetheless, the episodic nature of such adjustments confirms the textual point of the general lack of evidence that similar adjustments are made through the evidentiary process.

in not providing such instructions and the present practices systematically subvert the system's policies, or more plausibly the argument is simply wrong.[94]

One last point – juror psychology. Return to our example involving jurors estimating that individual assessments of liability lie somewhere between .51 and .7, and Levmore's claim that this is unlikely. The claim actually is one about juror psychology – how jurors are likely to assess masses of evidence. We think our suggestion is considerably more likely than Levmore's to be a fair representation of what actually occurs.[95] His involves a random distribution over wide ranges of probability, but no reason for this is given. And there are reasons to doubt it will occur. Each juror attends the same trial, witnesses the same events, hears the same evidence, and within loose constraints comes from the same milieu.[96] *A priori* one would think that individual assessments of liability would run over a rather small range of probabilities rather than across the entire range of possibilities. The more diverse the jurors, the less likely this is to be true, of course, but still there is great commonality among those seated as jurors in any particular trial.[97]

There is at least some reason to believe that trials will involve evidence with a relatively small range of probability. George Priest and Benjamin Klein have argued that when either the plaintiff (or defendant) has a very high (or very low) probability of succeeding on the claim, cases are less likely to be litigated and more likely to be

[94] We explain how the argument is wrong in Part V, *infra*. It mismodels the actual task at trial.
[95] Neither is very likely, however, as we explain in Part V, *infra*.
[96] Ladha, *supra* note 55, at 623 ("Clearly, the votes of real-life jurors *will be* correlated because the jurors hear the same evidence presented by various witnesses, the public prosecutor, and the defense attorney.").
[97] HARRY KALVEN, JR. & HANS ZEISEL, THE AMERICAN JURY 488 (1966) (This work demonstrates that the first vote of a jury is an extremely good predictor of the final result, which suggests that jurors perceive a narrow rather than large range of probability assessments); *see also* Marla R. Sandys & Ronald C. Dillehay, *First-Ballot Votes, Predeliberation Dispositions, and Final Verdicts in Jury Trials*, 19 LAW & HUM. BEHAV. 175 (1995).

settled.[98] Cases are more likely to be litigated when the "dispute is most problematic,"[99] which is when the case on the evidence is close and there is real uncertainty about its outcome.[100] Accordingly, assessments of liability in litigated cases may hover closer to the .51 mark rather than run the gamut from .51 to .99.[101]

C. Judge as Fact Finders and Other Curiosities

Arguments about proof rules must include or distinguish bench and jury trials, as there is nothing in the law that suggests the proof rules apply differently to judges than juries. Levmore notes this, but puts it aside.[102] This is inadequate. There are many bench trials in the United States every year.[103] If everything Levmore says about juries is true, then the law should be quite different for bench trials, unless the law is indeed an

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[98] George L. Priest & Benjamin Klein, *The Selection of Disputes for Litigation*, 13 J. LEGAL STUD. 1, 15-17 (1984).

[99] *Id*. at 17.

[100] *Id.* at 16. It is important to note, that the Priest-Klein model rests on a number of relatively restrictive assumptions including that the stakes of disputes are symmetric to both parties. *Id*. at 4-5, 20. Therefore, if there are differences in the stakes of litigation to the parties, the decision to litigate may vary slightly, and the theory, along with the 50 percent plaintiff win rate predicted by Priest and Klein, may not hold perfectly. Those critiquing the Priest-Klein model suggest that an asymmetric-information theory (rather than Priest-Klein's divergent-expectations theory) better explains trial outcomes; according to the critics, this is especially true in medical malpractice, product liability, employment discrimination and antitrust cases where plaintiff win rates tend to drop below 50 percent. *See*, *e.g.*, Keith N. Hylton, *An Asymmetric-Information Model of Litigation*, 22 INT'L REV. L. & ECON. 153 (2002). Other critics of the model have set forth a competing view on how cases get to trial. While Priest and Klein suggest that trials generally occur when the competing parties err in their estimates of a likely judgment, others suggest that a trial is the result of strategic bargaining that backfired. *See*, *e.g.*, Robert Cooter et al., *Bargaining in the Shadow of the Law: A Testable Model of Strategic Behavior*, 11 J. LEGAL STUD. 225 (1982); *see also* Frank B. Cross, *In Praise of Irrational Plaintiffs*, 86 CORNELL L. REV. 1, 11 (2000) ("The relatively high general tort rates are quite consistent with the predictions of Priest and Klein's fifty percent hypothesis, although the low product liability plaintiff win rates are suspicious and evidence that strategic litigation may be transpiring."); Samuel R. Gross & Kent D. Syverud, *Getting to No: A Study of Settlement Negotiations and the Selection of Cases for Trial*, 90 MICH. L. REV. 319, 320 (1991) ("Priest and Klein's intuitively appealing model of the selection of cases for trial provides a useful starting point for examining actual litigation. From that starting point we proceed to find strong evidence of strategic bargaining . . . and more than a hint that such bargaining is a major force in determining which cases fail to settle.").

[101] Again, we must caution that we doubt that analyzing jury decision making from a conventional probabilistic point of view is terribly cogent. *See supra* note 90, and Part V, *infra*.

[102] Levmore, *supra* note 10, at 752.

[103] For example, in 1996, there were an estimated 15,638 tort, contract, and real property trial cases in the 75 largest counties in the United States. U.S. Depart of Justice, *Civil Justice Statistics*: *State Courts*, *at* http://www.ojp.usdoj.gov/bjs/civil.htm (last revised on Oct. 1, 2001). Approximately 10,616 of those cases were jury trial cases while 4,628 were bench trial cases. *Id*.

ass. But, if it is an ass, it is not likely susceptible to being understood through algorithmic approaches like Levmore's. As we will discuss in Part V, we doubt the problem is in the law so much as in the methods of inquiry brought to it in this instance.

There is one other curiosity deserving of mention. Levmore's arguments are structured for a case involving two elements. As we elaborate in the next section,[104] there are virtually no such cases, and even the case he employs – a simple negligence case – virtually always has multiple elements.[105] To employ Levmore's argument to the phenomenon under investigation – the actual system of litigation – requires relaxing the artificial assumption of two elements. Doing so has unfortunate consequences. First, multiple elements make a complete hash of the argument about supermajority voting. As elements multiply, the conjunction of the means of the various ranges of probability of each element will quickly go toward 0.0, which means that defendants should almost always win. Second, multiple elements do not ameliorate the surprising result of the Condorcet argument that, as the probability as actually assessed by the jury reaches 0.0, we can be confident that the actual conjunction is greater than .5, and thus plaintiffs should always win. It simply makes the argument seem more bizarre; no matter how elements proliferate, (apparently making a plaintiff's case more difficult), plaintiffs should always win because the actual conjunction will always be greater than the median of the range from the product of the individual probabilities and 1.0. With added elements, such a product might get closer to 0.0, but it will never be less than 0.0, and the median of the range from the lowest possible figure of 0.0 to 1.0 is .5. When the artificial

[104] *See also* Part II, *supra*. All the pattern instructions reproduced there have more than two elements, as well.
[105] *See* Part IV.B and note 121, *infra*.

limit of two elements is relaxed, we are left with one argument that plaintiffs should always win, and another that defendants should almost always win. We suggest that this leaves us without any plausible arguments.

IV. MICROECONOMICS AND THE CONJUNCTION PROBLEM

Professor Alex Stein thinks the explanation of the conjunction paradox lies in a microeconomic analysis of litigation.[106] Stein asserts that the following probabilities structure civil litigation:

> (1) the probability of the litigated entitlement;
>
> (2) the probability of the entitlement's breach as a cause of the litigated damages; and,
>
> (3) the probability of damages resulting from the entitlement's breach.[107]

On the assumption that the tort system is designed to minimize the total cost of accidents, which is the primary claim of the microeconomic analysis of torts, each of these probabilities should be an *ex ante* probability, and liability should depend upon the probability of their conjunction exceeding .5.[108] However, because of numerous constraints of the real world – for example, "adjudication always follows, rather than precedes, the litigated event" – it is invariably too costly to determine the *ex ante* probability of breach.[109] Thus, if the law desires to achieve the optimal level of deterrence, then it must find "an economically justified surrogate" for the first-best proof

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[106] *See generally* Stein, *supra* note 11.

[107] *Id*. at 1203 ("Take an ordinary civil lawsuit in which the plaintiff must establish three independent elements: (1) . . . entitlement . . . (2) . . . breach . . . (3) . . . damage . . ."), 1216 ("In a paradigmatic civil trial, the following probabilities are at work: (1) . . . entitlement . . . (2) . . . breach . . . (3) . . . damage . . ."), 1221 ("Under existing doctrine, a lawsuit will succeed if each of its following three elements is more probable than not: (1) . . . entitlement . . . (2) . . . breach . . . (3) . . . damage . . .").

[108] *Id*. at 1216.

[109] *Id*. at 1220.

requirement of *ex ante* probability.[110] Stein argues that "adjusting" the ex post probability of breach by the ex ante probability of entitlement forms such a surrogate;[111] he states,

> By employing [the ex ante probability of entitlement] as the probability-aligning tool that brings [the ex post probability of breach] and the [ex ante probability of breach] closer to each other, the law also *removes it from the standard multiplication formula for conjunctive probabilities*. This removal is justified by the law's deterrence policy. In accordance with that policy, the law is primarily interested in the ex ante probability of breach; and because this probability cannot be determined at trial at an affordable cost, the law substitutes for it a suitable surrogate. Under this framework, [the ex ante probability of entitlement] serves as a misalignment-corrector for [the ex post probability of breach], *not as its conjunctive companion*.[112]

Stein does not elaborate on the nature of the adjustment that occurs, but he does not appear to be making an analytical point,[113] and for good reason. The relationship between the various probabilities that he has specified logically could be infinitely varied, and there is no analytic reason to think that the configuration he specifies is more likely than anything else. Thus, he must be making a counterfactual empirical point. He must be asserting that a system with infinite resources that employed the economically optimal rules would obtain results quite similar to those of the actual system of litigation.[114]

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[110] *Id*. at 1221-23.

[111] "Because the ex ante probability of breach does not exonerate the transgressor under the entitlement's conditions, this probability becomes immaterial. The entitlement's probability will thus dominate the ex ante probability of breach as an incentive for potential transgressors. Aware of the entitlement's nature and probability, a potential transgressor must introduce an appropriate adjustment in his ex ante probability of breach. This adjustment will substitute any initial level of his ex ante probability of breach with the level of the entitlement's probability." *Id*. at 1223-24.

[112] *Id*. at 1224 (emphasis added).

[113] He provides no demonstration generating his assertion as a deduction from acceptable premises; therefore we conclude it is an empirical rather than an analytical claim. If it is intended as an analytical claim, it must stand as an unsupported conjecture, which amounts to the same thing.

[114] Stein, *supra* note 11, at 1223-24.

Stein's article, like Levmore's, is complicated, insightful, and wide ranging.[115] As with Levmore's, our interest is focused on the treatment of the civil burden of persuasion. Whatever the article's other virtues, this part of the argument employs, like Levmore's, a formal argument in an *ad hoc* fashion and mismodels the system of litigation that is the object of inquiry.[116] We briefly address these two points in turn.

A. The Formal Economic Argument

Stein's economic argument is creative and original, but to apply it as he does to the ultimate object of the inquiry requires an unjustified leap of faith. It requires believing that his counterfactual assertion is true, and that, of the infinite number of ways the three variables (*ex ante* probability of entitlement, *ex ante* probability of breach, and *ex post* probability of breach) might relate to each other, they actually relate in precisely the manner necessary for the system to approximate optimal results. Maybe they do, and maybe they do not so relate, but it is obviously an empirical question, and Stein gives no good reason to think things are as they must be for his argument to be correct.

We may misunderstand Stein's various constructs, but the most direct understanding of them leads to skepticism that things are in the real world as they must be for his argument to work. For example, in the real world, every time a driver drives his car, he has a duty to take care that must translate, in Stein's terms, into an ex ante probability of entitlement of 1.0.[117] However, the ex ante probability that a person will breach his duty

[115] For example, he makes an interesting economic argument why damages are exempt from the product rule. *Id*. at 1229.

[116] Prof. Stein might be completely indifferent to these points, as his article can be understood as an exercise in economic modeling. Our interests, by contrast, are in empirical accuracy. *See, e.g.,* Ronald J. Allen & Brian Leiter, *Naturalized Epistemology and the Law of Evidence*. 87 VA. L. REV. 1491 (2001).

[117] And "duty" is typically at such a level of generality (e.g., "duty to drive safely") rather than at a much finer level (e.g., "duty not to get distracted talking to Sarah on the phone and hitting Ron in the

of care and, for example, hit a pedestrian while talking on a cell phone, is relatively low. This driver and thousands of other drivers regularly talk on cell phones while driving without hitting pedestrians. Nonetheless, if the driver gets distracted by his phone and accidentally hits a pedestrian causing some injury, he surely would be in breach of his duty of care with a probability of 1.0.

Perhaps the driver in our hypothetical should be held liable, but it is not because an alignment of *ex ante* and *ex post* probabilities of breach is effected by the *ex ante* probability of entitlement. Indeed, as we elaborate below, it is not even clear what this might mean, as the *ex ante* probability of entitlement in negligence cases is a question of law called "duty" in most United States jurisdictions, the probability of which is surely virtually always 1.0 or 0.0. It is only in the unusual case of first impression in tort that it would be sensible to talk of any other probability of entitlement. Nor should liability in this hypothetical depend on the assumed prohibitive cost of establishing the *ex ante* probability of breach, because in fact it would be quite easy and cheap to establish within rough parameters. The amount of driving that occurs can be estimated fairly accurately, as can the number of accidents involving cell phone use and pedestrians, and simple division yields a good estimate of the *ex ante* probability of breach. And, the driver's own driving and accidents patterns can be employed as well.

Perhaps we misconstrue what the *ex ante* probability is. Perhaps the *ex* ante knowledge of the driver, the probability of the pedestrian being in the wrong place at the wrong time, and the social value of using cell phones should also be taken into account,

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crosswalk"). If the concept of duty migrates toward the more finely grained, the distinction between "duty" and "breach" will be lost.

and so on. Doing so surely does result in making too many informational demands on the system, and may explain why there is almost no evidence that the negligence standard has been influenced by microeconomic reasoning.[118] Regardless of the actual state of the law, if Stein's point is to provide a surrogate for a measurement that cannot be obtained, obviously there is no way to know if the surrogate is an accurate approximation, and his economic argument fails accordingly. It is only the *ad hoc* insistence that the actual relationship between the relevant variables entails the desired result that holds the argument together, but no basis to believe that is provided.

In sum, the formalities of the microeconomic argument are held hostage to an unjustified and *ad hoc* vision of the empirical world. Thus, there is no reason to think the formal argument resolves the conjunction paradox. Even if that is not the case, however, the argument does not map onto the real world of litigation, to which we now turn.

B. Mismodeling the Legal System

Stein has offered his theory as an explanation of the conjunction paradox. For it to be such, it must explain the universe of civil litigation, or at least a large part of it.[119] As we discuss in this section, it does not do so; indeed, it does not even explain its primary object – simple negligence cases.

Stein's theory is based upon the assumption that civil trials always and only involve the three elements of entitlement, breach, and damage, each of which is litigated by the parties.[120] This is an inaccurate description of the law. A simple negligence claim typically involves: "(1) duty; (2) breach of that duty; (3) that the breach of duty be the

[118] *See Hedgehogs supra* note 4.
[119] *But see supra* note 116.
[120] *See supra* note 107, and accompanying text.

proximate cause of plaintiff's injury; and (4) that plaintiff did in fact suffer actual injury."[121] This black letter treatment of negligence reveals at least two ways in which Stein's theory mismodels the actual legal system.

First, Stein describes civil trials as involving an "entitlement" element, which, like "breach" and "damage," is litigated by the parties.[122] Although it is not absolutely clear what Stein means by entitlement, his article suggests that "entitlement" is a synonym for "duty."[123] In a traditional negligence action, the parties do not litigate duty as a fact because "the existence of a duty is a *question of law* for the *court to decide*."[124] Thus, the

[121] *Hudson v. Snyder Body Inc.*, 326 N.W.2d 149, 157 (Minn. 1982) (quotations and citation omitted); *see also Maffucci v. Royal Park Ltd. Partnership*, 707 A.2d 15, 24 (Conn. 1998) ("The essential elements of a cause of action in negligence are well established: duty; breach of that duty; causation; and actual injury.") (quotations and citation omitted); *Case v. Consumers Power Co.*, 615 N.W.2d 17, 20 (Mich. 2000) ("To establish a prima facie case of negligence, a plaintiff must prove four elements: (1) a duty owed by defendant to plaintiff, (2) a breach of that duty, (3) causation, and (4) damages.") (citation omitted); *Febesh v. Elcejay Inn Corp.*, 555 N.Y.S.2d 46, 47 (N.Y. App. Div. 1990) (". . . for a plaintiff to establish a cause of action sounding in negligence, he must meet the initial burden of showing 1) the existence of a duty flowing from defendant to plaintiff; 2) a breach of this duty; 3) a reasonably close causal connection between the contact and the resulting injury; and 4) actual loss, harm or damage.") (citation omitted); *Colvin v. Red Steel Co.*, 682 S.W.2d 243, 245 (Tex. 1984) ("To sustain a cause of action for negligence it is necessary to produce evidence of a duty, a breach of that duty, proximate cause and damage.") (citation omitted).

[122] Stein, *supra* note 11, at 1203 (an "ordinary civil lawsuit" is one "in which the plaintiff must establish three independent elements . . .").

[123] In his article, Stein utilizes a semi-real life scenario, which may better aid us in understanding what Stein believes to be an "entitlement." In Stein's scenario, contractor "C" builds a fence for house-owner "H," and guarantees that the fence will withstand bad weather. *Id*. at 1209-10. The fence falls down (because of bad weather) and causes damage. *Id*. The elements of breach and damage are relatively clear in this scenario. The entitlement element is less clear, but appears to be H's entitlement to rely upon C's guarantee – or put another way, C had a duty to construct the fence to withstand bad weather and to live up to his guarantee. *See id*. In this scenario it seems that H's entitlement is interchangeable with C's duty. Thus, we will proceed on the belief that "entitlement = duty."

[124] *Reed v. Beachy Const. Corp.*, 781 N.E.2d 1145, 1149 (Ind. Ct. App. 2002) (emphasis added); *see also Doe 1 v. Murrieta*, 102 Cal. App. 4th 899, 913 (2002) ("The determination of whether there is a duty is a question of law.") (citation omitted); *Maffucci*, 707 A.2d at 24 ("The existence of a duty is a question of law. . . .") (internal quotations and citation omitted); *Int'l Memory Products of Ill., Inc. v. Metro. Pier*, 781 N.E.2d 505, 512 (Ill. App. Ct. 2002) ("Whether a duty of care exists is a question of law to be determined by the court."); *Yakubowicz v. Paramount Pictures Corp.*, 536 N.E.2d 1067, 1070 (Mass. 1989) ("There can be negligence only where there is a duty to be careful, and whether there is a duty to be careful is a question of law.") (internal quotations and citation omitted); *Espinal v. Melville Snow Contractors, Inc*., 773 N.E.2d 485, 467 (N.Y. 2002) ("As we have often said, the existence and scope of a duty is a question of law."); *Bank of America NT & SA v. Hubert*, 62 P.3d 904, 911 (Wash. Ct. App. 2003) ("the existence of a duty is a question of law."). Questions of law may be questions of fact. *See* Ronald J. Allen & Michael S.

jury in negligence cases merely decides "whether an existing duty has been breached and if so, whether such breach was the legal cause of a claimant's injury or damage."[125] Second, even if duty is taken out of the picture, the jury still decides more than one other element, and is instructed to apply the burden of persuasion to each of them, not to their conjunction.[126] Thus, the conjunction problem remains. To be sure, simple negligence cases involve only barely more elements than the number Stein identifies, but that is all that is necessary for the conjunction paradox to be formally present.

Moreover, however Stein's argument is understood, it does not apply to a wide range of litigation. Many forms of liability do not include anything that much looks like what Stein refers to as an "entitlement." For example, matrimonial dissolution actions,[127] will contests,[128] paternity suits,[129] zoning actions,[130] and anti-trust actions[131] all appear to be

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Pardo, *The Myth of the Law-Fact* Distinction, 97 NW. L. REV. (forthcoming Summer 2003). However, even if this is so, they are not treated the same as factual findings at trial.

[125] *Sanderson v. Eckerd Corp.*, 780 So.2d 930, 933 (Fla. Dist. Ct. App. 2001).

[126] *See, e.g.*, *supra* notes 20, 30, and accompanying text, and *infra* note 138.

[127] For example, in an abandonment proceeding, the complaining spouse is not litigating that the abandoning spouse had any duty not to leave, or that he/she had any entitlement not to become a victim of abandonment. Indeed, the abandoned spouse is simply attempting to prove that that he/she has in fact been abandoned. *See*, *e.g.*, New York Pattern Jury Instructions: Civil, *Divorce – Abandonment* § 5:4, *available on* Westlaw database NY PJI (The instruction states that "the plaintiff must establish that (he, she) did not consent to the defendant's departure and that the defendant did not intend to return and did not return for a period of at least one year."). Similarly, proceedings adjudicating the existence of a common law marriage do not involve any duty/entitlement of one party to the other. *See* Alabama Pattern Jury Instructions: Civil, *Common Law Marriage – Elements* § 69.02, *available on* Westlaw database AL-APJICIV (The instruction states that in order for the plaintiff or defendant to establish the existence of a common law marriage, he or she must prove "the following essential elements existed: 1. The capacity to enter into a common law marriage; 2. The mutual intent to be husband and wife; 3. Public recognition of the relationship as a marriage; and 4. Open or public assumption of marital duties and obligations.").

[128] In a will contest concerning testamentary capacity, or concerning whether or not a will has been duly executed, one would be quite hard pressed to find Stein's "entitlement" element. *See*, *e.g.*, New York Pattern Jury Instructions: Civil, *Will Contests – Testamentary Capacity* § 7:48, *available on* Westlaw database NY PJI (In a case involving testamentary capacity, the jury must decide whether the testator was of "sound mind and memory" at the time of the execution of the will. The elements set forth for proof are: "First: [the testator] must understand that (he, she) is making a will. . . .; Second: the testator must be aware of the nature, extent and condition of (his, her) property. . . .; Third: the testator must be able to recall the persons who ordinarily would be the natural objects of (his, her) bounty, such as relatives, dependents, and the people with whom (he, she) has been associated, and their relationship to or association or connection with (him, her). . . ."); New York Pattern Jury Instructions: Civil, *Will Contests – Due Execution* § 7:45,

devoid of a litigated "entitlement," at least in the sense Professor Stein uses the term. Consider also, an action based on Illinois' Dram Shop Act – the standard jury instruction given in such cases reads:

> The Plaintiff has the burden of proving *each* of the following propositions:
>
> 1. That [intoxicated person] was intoxicated at the time of the [collision].
>
> 2. That the defendant . . . sold or gave intoxicating liquor consumed by [intoxicated person].
>
> 3. That the liquor thus consumed caused the intoxication . . . .
>
> 4. That [intoxicated person's] intoxication was at least one cause of the occurrence in question.
>
> 5. That as a result of the occurrence plaintiff suffered [damages].

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available on Westlaw database NY PJI (The instruction states that a will must "be executed in accordance with four statutory requirements: First, the testator must sign at the end of the will. Second, (he, she) must (sign in the presence of, acknowledge (his, her) signature to) at least two witnesses. Third, the testator must make known to the witnesses that the instrument is (his, her) will. Fourth, (he, she) must request each person to act as an attesting witness. . . . [The jury] should consider each of the questions separately.").

[129] In a paternity suit, the parties are merely litigating whether (alleged father) defendant is in fact the father of (mother) plaintiff's child; the plaintiff is not entitled to anything at this stage, nor does the defendant owe a duty to anyone at this stage. *See*, *e.g.*, Alabama Pattern Jury Instructions: Civil, *Paternity – Burden of Proof* § 70.03, *available on* Westlaw database AL-APJICIV (The jury instruction states that the "State of Alabama has the burden of reasonably satisfying you from the evidence that _____ (mother) became pregnant by the defendant, that the child in question was born alive and is alive now, and that the defendant is the child's real father.").

[130] For example, in an appeal of a zoning classification neither party is litigating an entitlement or even suggesting that one party owed a duty to another for any reason. The question before the court is merely whether the zoning body had a "fairly debatable reason" to apply a certain zoning classification to a particular piece of property. *See*, *e.g.*, Alabama Pattern Jury Instructions: Civil, *Zoning – Appeal Seeking Variance* § 60.01, *available on* Westlaw database AL-APJICIV.

[131] *See*, *e.g.*, Federal Jury Practice and Instructions: Civil, *Sherman Act – Essential Elements of a Plaintiff's Claim – Price Fixing* § 150.20, *available on* Westlaw database Fed-JI. The elements of an anti-trust claim under the Sherman Act are:

> First: That defendants _____ have combined and conspired to fix prices among themselves, and thus have unreasonably restrained interstate trade and commerce in the [*specify*] industry;
>
> Second: That defendants _____ have monopolized, and have conspired and attempted to monopolize, interstate trade and commerce in the [*specify*] industry;
>
> Third: That the activities of defendants _____ have proximately caused damage to plaintiff _____'s business and property.

This instruction does not appear to include what Stein calls an "entitlement," and clearly, the parties are not litigating an entitlement/duty element here.

> If you find . . . that *each of these propositions* has been proved, then your verdict should be for the plaintiff.[132]

Even if something in this type of case would pass as a litigated "entitlement" – such as the claimant was entitled to have the bar owner not serve intoxicating liquor to the intoxicated person who caused the claimant damage – the Dram Shop instruction, much like a simple negligence instruction, contains more elements than Stein's scheme allows.

So, too, does much of litigation. Stein's argument merely purports to explain why the probability of entitlement need not be multiplied by the probability of breach, and why the probability of damage need not be multiplied by either,[133] but the standard case does not involve only these elements (probably no case involves only those elements). The simple negligence instruction and the Dram Shop instruction are not anomalies. We have already given numerous examples of this, and could give a virtually endless list of pattern instructions involving more than three elements. Some further examples:

--In Illinois, negligence claims concerning an injury caused by a condition present on a specific piece of property involve six elements:

> The plaintiff has the burden of proving *each* of the following propositions:
>
> > First: That there was [a condition of the defendant's (land) (property)] which presented an unreasonable risk. . . .
> >
> > Second: That the defendant knew . . . that the condition of his [land] [property] involved an unreasonable risk of harm. . . .
> >
> > Third: That defendant should have anticipated that persons on the premises would not . . . realize the danger. . . .
> >
> > Fourth: That the defendant . . . was negligent.
> >
> > Fifth: That the plaintiff was injured.

[132] Illinois Pattern Jury Instructions: Civil, *Dram Shop Act – Burden of Proof – Injury to Person or Property by an Intoxicated Person* § 150.02 (West 2000) (emphasis added).
[133] Stein, *supra* note 11, at 1223-24, 1229.

Sixth: That the condition of defendant's [land] [property] was a proximate cause of the [injury] [damage] to the plaintiff.

If you find from your consideration of all the evidence that *any of these* propositions has not been proved, then your verdict should be for the defendant. . . .[134]

--in Indiana, a products liability claim involves seven elements:

The plaintiff must prove *each* of the following propositions by a preponderance of the evidence:

1. The defendant was a manufacturer of the product . . . alleged to be defective and was in the business of selling the product;

2. The defendant sold, leased or otherwise put the product into the stream of commerce;

3. The product was in a defective condition unreasonably dangerous to users or consumers . . .;

4. The plaintiff was in a class of persons the defendant should reasonably have foreseen as being subject to the harm caused by the defective condition;

5. The product was expected to and did reach the plaintiff without substantial alteration of the condition in which the product was sold by the defendant;

6. The plaintiff or plaintiff's property was physically harmed; and

7. The product was a proximate cause of the harm to the plaintiff or the plaintiff's property.[135]

--in Mississippi, medical malpractice claims involve five elements:

If you find from a preponderance of the evidence in this case that:

1. The plaintiff was a patient in the defendant's hospital; and

2. While a patient in the hospital, the plaintiff was suffering from a mental and physical condition; and

3. The defendant should have reasonably been aware of the plaintiff's condition; and

4. The defendant failed to provide the care and attention that the patient's condition reasonably required in that it [describe claimed negligent act(s)]; and

[134] Illinois Pattern Jury Instructions: Civil, *Burden of Proof – Negligence Only – Injury Caused by Condition of the Premises* § B120.09 (West 2000) (emphasis added).

[135] Indiana Pattern Jury Instructions: Civil, *Products Liability Against Manufacturer* § 7.03, LEXIS, Nexis Library, INCVJI File.

> 5. The defendant's failure to provide such care and attention was the sole proximate cause or proximate contributing cause of plaintiff's injuries;
>
> then your verdict shall be for the plaintiff.
>
> However, if you believe the plaintiff has failed to show *any one* of the above elements by a preponderance of the evidence in this case, then your verdict shall be for the defendant.[136]

--and, once again, in Illinois, a case involving liability to trespassing children requires the plaintiff to prove "*each* of the following" six elements:

> First: That the defendant knew . . . that children frequented defendant's premises.
>
> Second: That there was a (structure) (activity) on defendant's premises which was dangerous to children . . . .
>
> Third: That the expense or inconvenience to the defendant in protecting children against the risk would be slight in comparison to the risk of harm to them.
>
> Fourth: That defendant acted or failed to act . . . [and was therefore] negligent.
>
> Fifth: That plaintiff was injured.
>
> Sixth: That the negligence of the defendant was a proximate cause of the injury . . . to the plaintiff.[137]

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[136] Mississippi Model Jury Instructions: Civil, *Hospitals – General Negligence Instruction* § 14:1, *available on* Westlaw database MSPRACJIC (emphasis added).

[137] Illinois Pattern Jury Instructions: Civil, *Burden of Proof – Liability for Injury to Trespassing Children* § 120.04 (West 2000) (emphasis added). Other examples include:

> --a disparate impact claim under the Age Discrimination and Employment Act which involves four elements. The jury instruction reads:
>
> Plaintiff has the burden of proving *each* of the following by a preponderance of the evidence:
>
> 1. Plaintiff was [*not hired*] [*describe other specific discriminatory act*];
>
> 2. Plaintiff was 40 years of age or older at the time of the [*failure to hire*] [*describe other specific discriminatory act*];
>
> 3. Defendant had a specific [*employment practice*] [*selection criterion*] that caused plaintiff to be excluded from [*a job*] [*describe other specific discriminatory act*] because of plaintiff's age; and
>
> 4. Defendant's [*employment practice*] [*selection criterion*] had a substantial disparate impact on persons 40 years of age or older.
>
> KEVIN F. O'MALLEY, JAY E. GRENIG & HON. WILLIAM C. LEE, FEDERAL JURY PRACTICE & INSTRUCTION § 173.21 (5th ed. 2000).

In each of the above jury instructions, each of the elements must be established by a preponderance of the evidence,[138] there is an abundance of them, and it is difficult to see how any aligning of *ex* ante and *ex* post probabilities is occurring; and even if it is, the formal conjunction paradox remains.

V. THE NATURE OF JURIDICAL PROOF

Neither Levmore's nor Stein's argument disposes of the conjunction paradox as a formal matter. We suspect nobody can explain it formally, but we can explain why the conjunction paradox probably does not have perverse effects in the real world. The

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--a California claim based upon hostile environment harassment involves the following eight elements:

1. The defendant was a[n] [employer] [(other)];

2. The plaintiff was a[n] [employee of] [(other)] defendant;

3. The defendant engaged in harassing conduct directed toward the plaintiff, or plaintiff personally witnessed the harassing conduct and it took place in [his] [her] immediate work environment;

4. [(protected status)] was a motivating factor for the harassment;

5. This conduct was unwelcome and sufficiently severe or pervasive that it had the purpose or effect of altering the conditions [of plaintiff's [prospective] employment] [under which the plaintiff provided services] and creating an intimidating, hostile, abusive, or offensive working environment;

6. The environment created by the conduct would have been perceived as intimidating, hostile, abusive, or offensive by a reasonable person in the same position as the plaintiff;

7. The environment created was perceived by the plaintiff as intimidating, hostile, abusive, or offensive; and

8. This environment caused plaintiff injury, damage, loss, or harm.

California Jury Instructions: Civil, *Hostile Environment Harassment* § 12.05, *available on* Westlaw database CA-BAJI.

[138] In addition to the cases previously cited, see *Valentine*, 81 Cal. Rptr. 2d at 265 (". . . jurors must concur that *each element* of a cause of action has been proved by a preponderance of the evidence.") (citation omitted) (emphasis added); *Mile Hi Concrete, Inc. v. Matz*, 842 P.2d 198, 205 (Colo. 1992) ("To establish liability, a plaintiff must prove *each element* of a claim for relief by a preponderance of the evidence.") (emphasis added); *Sciortino v. Wood*, 829 So.2d 476, 478 (La. Ct. App. 2002) ("The plaintiff seeking damages in a civil action must prove *each element* of his claim by a preponderance of the evidence.") (citation omitted) (emphasis added); *Petit v. Key Bank of Maine*, 688 A.2d 427, 431 (Me. 1996) ("We have long recognized and applied the general rule that a plaintiff's burden of proof in a civil action is to establish *each factual element* of a claim by a preponderance of the evidence.") (emphasis added); *Febesh*, 555 N.Y.S.2d at 47 ("Where the plaintiff fails to introduce evidence legally sufficient to support *each and every one* of [duty, breach, causation and damage] essential elements, the jury cannot properly find that the defendant has been negligent.") (citation omitted) (emphasis added).

Prof. Stein may think that the problem is not in his model but in these instructions. That simply highlights the distance that can arise between theoretical modeling and empirical adequacy.

explanation has two related parts, one formal and one functional. First, the paradox depends upon an interpretation of probability that is inapplicable to the actual phenomenon of civil litigation. Second, the actual practice of civil litigation encourages the parties to formulate alternative hypotheses, over which a choice is made (or from which a choice is fashioned), rather than encouraging the litigation of elements and their negation, as is required for the paradox to have perverse effects. We discuss these two points in turn. Together, they demonstrate that a satisfactory non-algorithmic explanation can be provided for the proof rules, notwithstanding the failures of the efforts at sophisticated theoretical explanations.

A. Formalities: Juridical Proof and Conventional Probability Theory

Both Levmore and Stein assume that it is appropriate to interpret the preponderance standard as adopting a conventional probability measure of greater than a .5 probability – that, in other words, it is appropriate to model the plaintiff's burden as having to establish that the probability of each element exceeds .5. Neither explains what that might mean, and none of the possible meanings capture the phenomenon supposedly being modeled. Implicit in both presentations is that it is sensible to model trials as establishing elements or their negation, and that doing so exhausts the range of possibilities. As we show, this is not accurate or plausible.[139]

The meaning of a phrase such as "prove elements to a greater than .5 probability" is not self-evident. There are four standard interpretations: it can refer to a measure of

[139] Prof. Stein is fully aware of the difficulties in providing useful interpretations of "probability" in the present context, which confirms that the goal in his article lay more in economic modeling than empirical adequacy. *See* ARIEL PORAT & ALEX STEIN, TORT LIABILITY UNDER UNCERTAINTY 44-56 (2001).

relative frequency, logical probability, subjective probability,[140] or a propensity.[141] Relative frequency is a measure of the occurrence of a subset of events within a set of events – for example, how often did a coin come up heads when flipped a certain number of times? Logical probability involves *a priori* assessments of the probability of an event occurring, rather than a measurement of how frequently one outcome actually occurred in a repeated series of events. Subjective probability involves maintaining consistency among subjective states of belief. Propensity theories describe truly random events. None of these describe juridical proof.

Logical probability can be disposed of immediately. Trials do not involve *a priori* speculation about the logical relationships between events and the ways in which they may interact. Litigation obviously does not involve problems that are analogous to an *a priori* assessment of how probable any particular result of a throw of a die is, which is the paradigmatic example of logical probability. Trials are based on evidence of events that have already occurred.

Do they, then, look like a measure of relative frequency, which does involve *ex post* assessments of the relative frequency of different sets of events? Obviously not, at least as a general matter.[142] Rarely is relative frequency data provided at trial, and rarely are repeated trials of events conducted to observe the outcomes. Notwithstanding the modern fervor over expert testimony, evidence in statistical form is relatively

[140] *See generally* T. L. FINE, THEORIES OF PROBABILITY (Academic Press 1973), at chs. IV (Relative Frequency), VII (Logical Probability), VIII (Subjective Probability; DONALD GILLIES, PHILOSOPHICAL THEORIES OF PROBABILITY (2000).

[141] *See* D. MELLOR, THE MATTER OF CHANCE (1971); K. P. Popper, *The Propensity Interpretation of Probability*, 10 BRIT. J. PHIL. SCI. 25 (1959).

[142] Obviously, trials may involve statistical evidence, and some trials may turn on it. We are making claims about the general phenomenon, however.

infrequently provided; and, even when it is offered, it is virtually never offered on an element itself, which is the critical question. There may be relative frequency evidence that, along with other evidence, may permit an inference of an element, but virtually never is there any data of the relative frequency of the element itself, given all the evidence. Nor do fact finders bring such knowledge with them to the trial. Individuals certainly operate with many heuristics and beliefs that are a kind of summary of their experiences, but these do not tend to be in the form of relative frequencies.[143] There is, in short, virtually nothing at trial that looks comparable to testing whether a coin is evenly balanced by flipping it a large number of times and observing the outcomes, or whether a logical prediction about the outcome of the roll of a die will be vindicated in practice.

Interestingly, if either of these critiques of logical and relative frequency interpretations of probability as applied to trials is wrong, then all the consternation over the conjunction paradox has the problem exactly backwards. The concern of the conjunction paradox is that the plaintiff will win in the face of a high probability that he or she deserves to lose. In fact, if the plaintiff must establish that the probability of each element exceeds .5 on either a logical possibility or relative frequency interpretation of probability, plaintiffs could rarely win their cases, and thus their burden is too high rather than too low.

Take logical probability first. To specify the logical relationships among events requires an exhaustive listing of all the ways the events could be – for example, how many faces are on a die, how are they configured, how is the die weighted, are any of the

[143] Knowledge about life tends to be embedded in stories and scripts, as we return to, *infra*. This isn't to say that there is no other kind of knowledge, or that, if there is, it is never relevant to trials. We are dealing with the standard case.

faces magnetized, and so on. A plaintiff would have to specify all the ways the world could be with respect to each element, and demonstrate that the sum of the probabilities of the way that the world could be favoring liability exceeds .5. We are not even sure this task is comprehensible; but if it is, it is not achievable. There are virtually an infinite number of ways the world might be, and no plaintiff has the resources or knowledge to specify them, let alone logically appraise their probabilities.[144]

A relative frequency interpretation suffers in a sense from the opposite problem. Proving a relative frequency requires the plaintiff to show all the ways in which the world could have been with respect to the elements, and that half of those ways plus one favor liability.[145] This, again, is a nearly impossible task that virtually no plaintiff will ever be able to accomplish.[146]

The arguments of Levmore and Stein neglect that to establish either a logical probability or a relative frequency requires knowing what the negation of an element

[144] What makes logical probability operate is an *a priori* belief about the probability of events. In cases apparently involving stochastic independence, this reduces to a belief of equal probability of the events, such as the equal probability of any face of an evenly balanced die coming up on a throw. It is not at all obvious how this would be applied in the real world of complex events, where an assumption of equal probability hardly seems warranted.

[145] Actually, a standard relative frequency account would require that the relevant event be repeated a large number of times, with the outcomes observed, like flipping a coin or rolling a die. Again, what this might mean in the real world of litigation is at best obscure. We try to give a plausible interpretation of it in the text.

[146] If either task could be done (showing the ways the world might be or might have been), Alvin I. Goldman, *Quasi-Objective Bayesianism and Legal Evidence*, 42 JURIMETRICS 237 (2002), argues that a truth conducive "quasi-Bayesian" theory of proof can be constructed. The trouble is that neither task can be accomplished. Moreover, it would have to be accomplished over every piece of evidence introduced, whatever that might mean. On the ambiguity of the concept of juridical evidence, see Ronald J. Allen, *Factual Ambiguity and a Theory of Evidence*, 88 Nw. U. L. Rev. 604 (1994). Goldman is sensitive to these difficulties, but neglects that the critical question for a theory of inference is not whether it can explain a single evidentiary proffer under unrealistic conditions, but all or much of the evidentiary proffers under realistic conditions. *See* Goldman, *supra*, at 249-52. All of the conventional interpretations of probability can be used to explain single proffers under unrealistic conditions.

entails, and both assume that it is appropriate to model a decision as X or not-X.[147] It is not appropriate to model the decision of most legal elements in this fashion. To make this concrete, suppose "heads" is conceived of as the "element" of a cause of action and consider how a calculation of either the logical probability or the relative frequency of a series of coin flips would occur. With respect to logical probability, the possibilities are, in a sense, heads or not heads, but "not heads" is precisely defined. It can only be tails or landing on an edge. The same is true with respect to a relative frequency, and simple tests can be done. At trial, by contrast, the negation of an element will typically be a large and unruly set of possibilities. Take causation as an example. For the plaintiff to prove that "causation" by the defendant is more likely than "no causation" would require the plaintiff to specify, and disprove, all the ways in which someone other than the defendant might have caused the result. Without such knowledge, evidence of what the defendant did is essentially meaningless. Even the most damning evidence can be explained; and without all possible explanations provided and considered,[148] no meaningful assessment of the conventional "probability" of causation or no causation can be provided. And so on.[149]

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[147] While he does not discuss these points in his economic argument, Prof. Stein is fully aware of these matters, which further suggests his interests were in economic modeling rather than accurate description. *See, e.g.,* Alex Stein, *The Refoundation of Evidence Law*, 9 CAN. J. L. & JUR. 279 (1996); PORAT & STEIN, *supra* note 139, at ch. I, pt. E, *Two Interpretations of the Civil Standard of Proof*, and n.81.

[148] Suppose DNA indicates a person is the father of the child. What if he is one of quintuplets?

[149] Interestingly, the implications of the formal analysis of the conjunction paradox and those of giving a standard probability interpretation to the phrase "proof by a preponderance" have offsetting consequences. The former results in the plaintiff's burden being too low, while the latter results in it being too high. Maybe the combined effect is that it is just right. This sounds, of course, like the kind of argument that we criticized Levmore for making. Our only defense is that we are not employing it as an *ad hoc* move to save a formal theory from its own implications, but instead merely identifying it as one of many pragmatic factors that may be operating to eliminate the perverse effect of the formal conjunction paradox standing alone. We also do not make much of the point ourselves. We think the real explanation as to why the conjunction paradox is not perverse lies in the reality of juridical proof, as we explore in the remainder of this section.

It is, in part, for reasons such as these that theorizing about evidence and trials has explored subjective Bayesian conceptions of proof at trial.[150] Subjective Bayesianism refers to a rigorous manner of keeping one's beliefs consistent. If a person begins with a consistent belief set, under certain assumptions one can update the belief set in an orderly fashion in light of new evidence. The attraction of such a theory for the field of evidence is apparent; trials certainly can be modeled as a rational updating of prior beliefs in light of new evidence. Nonetheless, this formalization of probability also cannot explain juridical proof.

First, if the decision being made is designed to reflect something about the real world, subjective Bayesian approaches have all the previous constraints of other forms of conventional probability. For a person to form a rational assessment of the probability of some element, all the alternatives must be considered, and so we are back precisely where we were with respect to logical probability and relative frequencies. If this point is neglected, and a fact finder is told to form an assessment of some element without adequate context, there is literally no reason to think that such an assessment would have any particular relationship to reality. This leads to the second problem with Bayesian approaches – they quickly lead to radical subjectivity.[151] Even a well motivated decision maker trying to determine accurately the facts almost never has reliable information about discrete pieces of evidence that can be translated into likelihood ratios that can be used within Bayes' Theorem to produce reliable outputs. Moreover, jurors do not reason naturally through the formal application of Bayes' Theorem, and asking them to do so is

[150] *See, e.g.*, INT'L J. OF EVIDENCE & PROOF, Special Issue: Bayesianism & Juridical Proof, (Ronald J. Allen & Mike Redmayne eds., 1997) [hereinafter Special Issue].

[151] Goldman, *supra* note 146, at 239 ("It is not at all clear how purely subjective Bayesian methods, applied to the legal context, hold any promise of leading a trier of fact to truth.").

likely to lead to unpredictable results.[152] Radical subjectivity and unpredictability in turn are inconsistent with all theories of trials having factual accuracy as a primary goal, which essentially means all acceptable theories of trials. And if factual accuracy is not an issue, the conjunction paradox would disappear as a matter of concern.

There are other limitations to Bayesian approaches, as well. In particular, the process at trial is directly inconsistent with Bayesian requirements. This has been thoroughly demonstrated in the literature,[153] and we will give only a few brief examples here. For Bayesian updating to occur, at a minimum, all the hypotheses of interest must be articulated, and then they may be updated in light of new evidence.[154] Neither occurs at

[152] This is why careful commentators invoke Bayes' Theorem as part of an "idealized theory of forensic proof" and perceive the need "to attempt to formulate a philosophically adequate account of the interpersonal and logical standards that promote accurate estimation" of the facts upon which a verdict should rest. David H. Kaye, *Do We Need a Calculus of Weight to Understand Proof Beyond a Reasonable Doubt?*, 66 B.U.L. REV. 657, 671 (1986). A project to which our article is quite sympathetic.

[153] *See*, *e.g.*, *Grand Illusion*, *supra* note 5, at 43-44; Special Issue, *supra* note 150, at Ronald J. Allen, *Rationality, Algorithms and Juridical Proof: A Preliminary Inquiry* 254, 263-71 [hereinafter *A Preliminary Inquiry*].

[154] These are necessary but not sufficient conditions for the operation of subjective Bayesianism. For subjective belief states to be computable, a formalization of subjective probability is required – the most well known of these formalizations was created by Leonard J. Savage. *See generally* LEONARD J. SAVAGE, THE FOUNDATIONS OF STATISTICS (2d ed. rev. 1972). Savage's assumptions do not map onto trials. *See* Allen, *A Preliminary Inquiry*, *supra* note 153, at 260-70. A number of commentators within the field of evidence rely on subjective probability, but fail to attend to the assumptions necessary for Bayesian subjectivism to operate algorithmically. For example, Richard Friedman has asserted that "the only constraints that Bayesianism puts on the probabilities that an observer may assign to a set of propositions are that they be in the range from zero to one and that they meet conditions of consistency with each other." Friedman, *supra* note 17, at 2042. To our knowledge, this description does not accurately identify the requirements of any formalization of subjective probability. It is directly inconsistent with Savage's, which includes among other constraints the sure thing principle. *See* SAVAGE, *supra*, at 21-26. To our knowledge, no proponent of Bayesian approaches to legal evidence has ever examined the necessary assumptions for subjective probabilities to be computable, although this has been called to their attention. *A Preliminary Inquiry*, *supra* note 153. This is another example of the curious phenomenon of the *ad hoc* use of formal arguments, of appearing to rely on the formal argument by being indifferent to its foundation. This may have some value as a heuristic, see, for example, Special Issue, *supra* note 150, at Richard O. Lempert, *Of Flutes, Oboes and the As If World of Evidence Law* 316, but the value of such a loose use of theoretical constructs for advancing knowledge is doubtful.

trial.[155] The hypotheses of interest are typically not articulated until closing argument, and jurors are told not to form conclusions on the evidence until all the evidence is in. By the time all the theories are unveiled and all the evidence heard, there is no longer any updating to occur. Probability assessments might still be made at that point, but that has nothing to do with Bayes Theorem.

Propensity theories of probability fare no better. They were developed originally as a means of conceptualizing the implications of the truly stochastic processes of quantum mechanics, and as Alvin Goldman has trenchantly pointed out, "events involved in the legal domain are not governed by stochastic laws of the sort found in quantum mechanics."[156] Various attempts have been made to provide versions of the propensity interpretation of probability that permit objective probability statements to be made about singular events outside the domain of quantum mechanics, but they invariably reduce to frequentist accounts with the problems previous identified, or make a series of ad hoc moves that make their application to legal affairs exceedingly problematic.[157]

In sum, conceptualizing the proof process at trial as proving elements or their negation has no plausible, truth conducive, operationalization in the standard conceptions of probability. There is no plausible interpretation within conventional probability that can be given to the idea that plaintiffs must prove each of the elements to a greater than .5 probability that is likely to increase accuracy of adjudication. If any of the standard interpretations of probability is applied to the preponderance rule, the implications of the

[155] This is a different point from the previous one in the text. There the question is the relationship between subjective beliefs and the real world. Here the question is the relationship between trial practice and the minimal requirements of Bayes' Theorem.
[156] Goldman, *supra* note 146, at 246.
[157] For an excellent discussion, see Mike Redmayne, *Objective Probabilities and the Assessment of Evidence* (manuscript in the possession of authors).

conjunction paradox are precisely the opposite of those that concern Levmore and Stein. That the actual implication of the concerns expressed by such astute observers as these two is exactly the opposite of what they assert should alert us that something is amiss. And it is. What is amiss is that trials are not structured to litigate the probability of elements and their negations; they are structured to permit choices over the hypotheses advanced by the parties, as we now turn to.

B. Functionalism: Juridical Proof and the Relative Plausibility Theory

Most discussions of the proof paradoxes isolate the burden of proof instructions from all other trial related activity. This is a mistake. When trials, including pretrial processes, are viewed as a whole, a much different picture emerges of the nature of juridical proof; that picture involves the parties asserting a limited number of the ways in which the universe might have been on the litigated day in question, and the fact finder focusing at least initially on those competing hypotheses. So viewing the proof process, in addition to being descriptively more accurate, eliminates the formal problems of proof captured by the conjunction paradox.

Consider, first, pre-trial proceedings. Although pleading practice is often fairly uninformative of the parties' contentions, discovery fills in many of the gaps, and discovery is a two-way street. Not only do plaintiffs have to divulge their factual and legal theories through discovery, so, too, do defendants. By the time trial occurs, the standard context involves a reasonably sharp disagreement over two stories of what occurred, and their legal implications.[158] Thus, parties discard much of the possible ambiguity surrounding events and choose to litigate only a part of it. To be sure, subject

[158] Pre-trial orders continue the winnowing process.

to judicial control of the proceedings, a plaintiff or defendant does not have to identify a single factual or legal theory, but the failure to do so has pragmatic consequences, thus encouraging parties to do so. The parties ought to know what they think happened, and the failure to identify a clear alternative to the opposition may be taken by fact finders as indicating that the opposition's story is probably true.[159] The formalities of trial practice and the pragmatics of natural reasoning processes thus converge to reduce the dispute at trial to the choice over alternative competing stories.[160]

Now consider the trial stories themselves. Typically, these will be stories of real events happening in the real world. That in turn means they will typically be integrated stories in which the parts are highly dependent. Dependence alone does not eliminate the conjunction paradox, but it has a related attribute. If trials involve integrated events, and if one "element" is unlikely, then so, too, is the story of which it is a necessary part. If "preponderance of the evidence" means something like "do you believe the elements are true," and the answer to one of them is "no," that is a very good reason to doubt that the story in which it is embedded is true. Indeed, the integrated stories litigated at trial are typically highly similar, varying in only a few factual respects.[161] Consider a contract case, for example. Typically, the parties' claims about most contract formation and execution will be identical, even if there is a claim about breach or nonperformance. By requiring both parties to articulate their factual assertions, a trial is usually reduced to a

[159] We return below to what the word "probably" means in this sentence.

[160] For a collection of cases adopting the relative plausibility approach, see Allen & Leiter, *supra* note 116, at 1532-34. For another recent recognition of its utility, see *In re Blech Securities Regulation*, 2003 U.S. Dist. LEXIS 4650, at *55 (S.D.N.Y. March 26, 2003) ("In this case, the jury can best form a judgment when presented with the two experts' competing theories.").

[161] See transcripts in RONALD J. ALLEN, RICHARD B. KAHNS & ELANOR SWIFT, EVIDENCE: TEXT, PROBLEMS, AND CASES 1-89 (3rd ed. 2002) and RICHARD O. LEMPERT, SAMUEL R. GROSS, JAMES S. LIEBMAN, A MODERN APPROACH TO EVIDENCE 13-26 (West 2000). This is also consistent with the prediction of the Priest-Klein theory discussed *supra*.

real dispute over a very small number of facts, and perhaps only one. Levmore was right to suggest that this might be the case, although for a different reason than he identified. It is not that many trials involve only one formal element; it is that the stories told by the parties will often be highly similar, differing in only a few salient factual respects. However, disputes over a single fact can constitute disputes over every formal element. An example is a case of slander where the defense disputes that the words were spoken. Even if they were spoken, they may not be demeaning, even if they are, there may be no damages, and so on.[162]

It is these and similar points that led to the emergence of the relative plausibility theory[163] of juridical proof. The critical points are that litigation involves the choice by the fact finder over the stories advanced by the parties (or of a story constructed in light of the parties), and that proof is largely comparative or ordinal rather than cardinal, as entailed by conventional probabilistic accounts.[164] For reasons noted above and others, this approach does not suffer from the formal problems that afflict conventional probability accounts, and it more accurately describes the pre-trial and trial processes. Indeed, it explains a range of trial related phenomena, such as various rules of evidence, that the conventional probabilistic approaches do not explain as well (at all, actually).[165] Moreover, the relative plausibility structure of the civil litigation system may very well advance the primary goal of accurate adjudication. The parties know their dispute best,

[162] *See* Porat & Stein, *supra* note 139, at 52, n.83.
[163] It is a "theory" of a different kind, however. It is not algorithmic or formal in any fashion.
[164] The possibility of fact finder creativity in determining what happened is not a problem for the relative plausibility theory, as what matters is story formation.
[165] *See Juridical Proof*, *supra* note 6, at 413-20. Moreover, many rules of evidence appear in tension with a conventional probabilistic approach. For example, propensity evidence is disfavored by the rules – see, for example, FED. R. EVID. 404(b) – whereas it is compatible with probabilistic approaches. Similarly, courts are cautious in admitting prior happenings evidence, although no rule formally requires its exclusion. For a discussion, see ALLEN, KUHNS & SWIFT, *supra* note 161, at 377-84.

what is critical and what peripheral, what likely will and will not be enlightening, and so on. They also know that an adversary stands ready to point out any shortcomings and difficulties in their story, which will be done in part through rhetoric but most importantly through evidence of the facts constituting their competing stories. By focusing attention on the relationship between claims and evidence in a conventional manner, as judged by fact finders astute in human affairs, it is at least reasonable to think that errors may be kept to a minimum.

The relative plausibility theory can be criticized on various grounds. Most importantly, it denies that the burden of persuasion instructions can be taken literally as requiring judgments based on the serial determination of elements. It does not, however, rest on the mistaken view that the burden of persuasion focuses on the conjunction instead. It is not the conjunction of elements that determines outcomes; it is whether the plaintiff's story is more plausible than the defendant's. This does discount the significance of the burden of persuasion instructions, and is a weakness in the theory (it would be better to explain everything). However, by discounting that one part of the proof process, virtually all the rest can be explained. Unlike the arguments of Levmore and Stein, the virtue of the relative plausibility theory does not depend on a series of *ad hoc* moves in the context of what purport to be formal arguments. Part of its virtue lies in demonstrating how the persuasion rule is simply the odd man out, as it were, and that it does not easily coexist within the web of rules and practices that surround it.

The relative plausibility theory has other virtues as well. There is a substantial amount of data on how lawyers litigate and jurors decide cases. Lawyers present

coherent, integrated stories,[166] and jurors construct integrated stories of what happened, and then map the story onto the verdict possibilities.[167] How either process is consistent with the portrayal of litigation that emerges from Levmore's and Stein's approach is not clear. What occurs at trial is perfectly consistent with the relative plausibility theory.

Two other points deserve attention. As Levmore's article points out, litigation can involve multiple stories or multiple legal theories (Levmore discusses only the latter). Multiple stories are not a difficulty for the relative plausibility theory, as it easily extends to a comparison of the plausibility of various litigated ways the world might have been that favor the various parties. The ultimate extension of this might be a specification of all the ways the world might have been on the day in question, which begins to approximate the logical probability and relative frequency approaches criticized above. The critical difference is that those approaches require such a specification, whereas the relative plausibility theory merely permits it if the parties so choose, and of course they never do. This is, thus, only a logical, not a real objection to the theory.

Multiple legal theories present a different question from multiple stories concerning the same legal theory. With multiple stories, the posture of plaintiffs and defendants is symmetric: Whichever story or collection of stories is most plausible should win. This is not true with regard to multiple legal theories (at least those involving differing facts). Consider a case involving three different legal theories and three different factual foundations. Plaintiffs deserve to win if one of the stories embodying one legal theory is

[166] *See* W. LANCE BENNET & MARTHA S. FELDMAN, RECONSTRUCTING REALITY IN THE COURTROOM: JUSTICE AND JUDGEMENT IN AMERICAN CULTURE (1981).
[167] *See* Nancy Pennington & Reid Hastie, *A Cognitive Theory of Juror Decision Making: The Story Model*, 13 CARDOZO L. REV. 519 (1991); *see also* Jill E. Huntley & Mark Costanzo, *Sexual Harassment Stories: Testing a Study-Mediated Model of Juror Decision-Making in Civil Litigation*, 27 L. & HUM. BEHAV. 29 (2003) (reports empirical work on the story model).

true; defendants deserve to win only if all of their competing stories are true (for if this if false, one of the plaintiff's stories is true). For example, assume the plaintiff has alleged defective design, defective manufacture, and failure to warn theories. If the probability of each is .25, the "probability" of each not being true is .75. But, the probability of at least one being true is $1 - .75^3 = .58$, and perhaps plaintiff should win, even though the individual probabilities of each being false is .75.

Levmore's amelioration of this problem is, as before, to assert that the probability of a cause of action equaling .25 really means something else, and thus things may work out acceptably.[168] Our solution is quite different; it is that the problem has no real world specification.[169] The information necessary for it to be a problem will virtually never exist, and thus it will never arise. Again, no plausible meaning within conventional probability applicable to the legal setting can be given to the concept "the probability of a design defect is X." What will arise is a story about defective design and a story about

[168] Levmore, *supra* note 10, at 745-56.

[169] The problems generated by attempting to take seriously such an unworldly hypothetical are well presented by the attempt of Frederick Schauer & Richard Zeckhauser, *On the Degree of Confidence for Adverse Decisions*, 25 J. LEGAL STUD. 27 (1996), to analyze the implications of three or more "independent" charges of sexual harassment. *Id*. at 41-43. Their concern is decisions outside of litigation, such as dismissal of a teacher, but the strained nature of the analysis is invariant over the setting. If three claims of sexual harassment against a teacher are made, any competent decision maker would want to investigate what factors generated the complaints and their actual ontological status. Are they really independent or part of a campaign against a particular teacher? Why are there three apparently independent claims with exactly the same probability? Doesn't that suggest they are probably not independent? How often are claims made against teachers? Is it a fluke that three claims have been lodged against this one, and if so, is it because so many or so few have been lodged? And so on. Human decision makers will not happily accept this stylized hypothetical as an adequate ground for decision, and, even if more information is not forthcoming, that factor itself will be viewed as containing information. Moreover, when the setting is shifted to the litigation arena, another problem becomes obvious. Suppose three such civil complaints so that the probability of one being true exceeds .5. Which one? Who gets the award? This also applies to three separate causes of action based on the same facts, as recovery will be cause of action dependent. To be sure, this kind of statistical approach can be viewed as analyzing the limiting case of evidence and procedure, but its primary import is to demonstrate another reason why the system of litigation forces cases away from this quasi-statistical mode into that of plausible human stories. The significance of human stories in criminal litigation has been noted explicitly by the Supreme Court in *Old Chief v. United States*, 519 U.S. 172 (1997) ("a syllogism is not a story").

appropriate design, a story about defective manufacturing and a story about appropriate manufacturing, a story about failure to warn and a story about no duty to warn, and so on. Liability will depend on which of each dichotomy is thought to be more plausible. This has a mild effect of somewhat approximating the "proper" statistical outcome: Plaintiff will win if any of the three stories embodying the three legal theories is more plausible than its counterpart offered by the defendant, although it differs in that the fact finder would need to specify which one. In any event, the critical difference is that, within the relative plausibility theory, it is unnecessary to put this dynamic into conventional probabilistic terms, and thus an impossible condition is excused rather than required.[170]

Professor Richard Friedman has raised another objection to the relative plausibility theory, suggesting that perhaps the theory cannot handle intermediate burdens of persuasion such as clear and convincing evidence.[171] He implies that the explanation given of clear and convincing evidence that it "is simply a considerably more persuasive story than its opposition," can only be understood by collapsing it into conventional probability, and giving it a meaning of requiring proof of elements to exceed some higher number than normal, .75 perhaps. This criticism seems to be motivated by the belief that ordinal mathematics cannot accommodate any measures of relative rank other than

[170] Another advantage is that it maps onto the way humans actually reason. If a person is annoyed with another for three separate reasons, and receives three separate convincing responses, one does not remain annoyed because the probability of one of the three, (even though one does not know which one), exceeds some probability threshold. Rather, one deals with things serially. Perhaps the statistician would say we are wrong to do so, but then the question would be whether the law should defer to the statistician or the great majority of mankind. We cheerily concede that, were the world different and accurate statistical accounts could be given of these various phenomena, the analysis would differ accordingly, but "it is also true that if my nephew Andy had wheels and a six-cylinder engine, he might function as a Pontiac Firebird." Craig R. Callen, *A Brief Word on the Statistical Debate*, 66 TULANE L. REV. 1405, 1409 (1992). True enough, but its implications for the world we inhabit are opaque at best.

[171] Friedman, *supra* note 17, at 2047. The relative plausibility theory gives a good account of proof beyond reasonable doubt. *See Juridical Proof*, *supra* note 6, at 382-84.

"greater than" – that ordinal mathematics cannot accommodate, for example, "much greater than."

There are two responses to this criticism. First, which in a sense captures precisely the significance of this article, we are trying to explain the relationship between natural reasoning and trial processes, not mathematics. Even if there is a conflict between the universal intuition that "much greater than" makes sense in comparative terms and mathematics unless the concept is reduced to cardinality, Friedman's criticism privileges for no good reason mathematics over natural reasoning processes. Even if there is a conflict between ordinal mathematics and natural reasoning, why assume that the problem lies in the state of human intuition rather than in the developmental state of ordinal mathematics? More importantly, there is a well developed mathematics of ordinal numbers,[172] and it includes ways to capture the concept that A is much bigger than B,[173] although we see no great significance to the point.

[172] *See, e.g.,* Grzegorz Bancerek, *Ordinal Arithmetics*, 2 J. FORMALIZED MATHEMATICS 515 (1990).

[173] In particular, the cofinality of A is greater than B if no sequence of ordinals less than A which is indexed by B has A as its limit. Informally, the idea is that one cannot get up to A in B many jumps, no matter how big the jumps are. For discussions, see JUDITH ROITMAN, INTRODUCTION TO MODERN SET THEORY 90-92 (WILEY 1990) and HERBERT B. ENDERTON, ELEMENTS OF SET THEORY 257-62 (Academic Press 1997). As should be clear, we are not claiming that this concept maps directly onto the "clear and convincing" standard; rather, we are only pointing out that there is no reason to think that the intuition that the concept "much greater than" is coherent is mistaken. There are other mathematical efforts to deal with qualitative assessments of probability. A qualitative probability is essentially a listing of all of the subsets of a set in order of likelihood. A set "A" can be thought of as much more likely than "B" if there are a large number of sets that sit between them on the list. Moreover, suppose that there is a qualitative probability known to arise from some probability measure. Under certain conditions, various things can be known of it; for example, that it is twice as probable as some other probability measure, even though neither probability measure is known. For a discussion, see Peter C. Fishburn, *Finite Linear Qualitative Probability*, 40 J. OF MATHEMATICAL PSYCHOL. 64 (1996). We are indebted to Jeff Hirst of Appalachian State University and Paul Edelman of Vanderbilt University for their assistance on the mathematics of ordinality.

The relative plausibility theory thus eliminates the conjunction problem by avoiding it entirely, and explains most of what actually occurs at trial and in discovery.[174] It has the added virtue of generating readily testable hypotheses about the behavior and decision making of trial participants, unlike the formal theories of Levmore and Stein, which would be difficult if not impossible to test. By itself, this certainly does not increase the probability of its being true, but it is at least somewhat comforting that a theory propounded about the real world does not have to be taken almost exclusively on faith.

The most serious criticism of the relative plausibility theorem is that "plausibility" is not well defined. Two points need to be made here. First, we are trying to explain human decision making in litigation, and from that perspective there is no *a priori* reason why any particular concept needs to be well defined in a logical sense. To make such a demand is to make precisely the mistake that the algorithmic efforts to explain the burden of persuasion make; it begs the question whether such an approach is appropriate. The more telling question is whether the concept of plausibility has a real world analogue, and the answer to that is plainly yes. Everyone reading these sentences has full confidence in their general capacity to make judgments of the relative plausibility of different scenarios; everyone does it all the time. Moreover the relative plausibility theory easily maps onto the work of the cognitive scientists who are attempting to uncover how

[174] Interestingly, special verdicts may be at odds with the relative plausibility story, but they also may be at odds with how humans reason about litigated events, which may explain why they are only infrequently used notwithstanding calls by commentators for their increased use. For an interesting examination of the implications of special verdicts, see David A. Lombardero, *Do Special Verdicts Improve the Structure of Jury Decision-Making?*, 36 JURIMETRICS 275 (1996). Lombardero examines the potential consequences and logical effects of special verdicts. However, the article does not address how jurors actually instructed on special verdicts administer them. It may be the case that jurors still form stories and then map the stories onto the verdict choices. Indeed, in one sense, all special verdicts do is require the jury to convey to the judge the decision making process it goes through under the story model. The point, of course, is that special verdicts pose empirical questions rather than purely analytical ones.

humans actually make decisions through such considerations as completeness, coherence, consistency, and coverage.[175]

But there is a second response, one that in a fashion closes the circle of our argument. "Relative plausibility" can be interpreted in a multitude of ways, at least heuristically. It can bear at least informally a relative frequency interpretation, where the task of the jury would be understood as attempting to get correct results in the long run. Of course, no such data will ever exist to test the outcomes, which is why we label these interpretations "heuristics." It can be given a Bayesian interpretation to the effect that jurors should decide in favor of that party that the juror believes has better established its case, or an inductivist interpretation grading the level of inductive support. It can be given a hypothesis testing interpretation that the task is to determine the probability of the evidence, given a particular hypothesis, or a parallel distributing process interpretation,[176] and so on. Nonetheless, all of these interpretations would be parasitic on an obvious and well known human practice, could not be truly formalized, and in any event there is no reason to believe that the accuracy of trial outcomes would be advanced by attempting to shoehorn what humans actually do into one of these, or any other similar, explanations or protocols. Each of these formal processes captures an aspect of reason, but none of them captures it entirely. The relatively primitive notion of deciding the relative plausibility of human affairs, by contrast, captures precisely what humans do, and for which there is substantial evidence to believe they do it well.

[175] *See* Pennington & Hastie, *supra* note 167.
[176] *See*, *e.g.*, PAUL THAGARD, CONCEPTUAL REVOLUTIONS (1992).

VI. ALGORITHMS AND EXPLANATIONS

Much like Prof. Nance suggested, we suspect that the historical explanation for the conventional treatment of the preponderance standard resulted from the impulse to emphasize that all necessary parts of a plaintiff's story must be supported by adequate evidence. Standing alone, though, that admonition is quite uninformative of what a showing satisfactory for a verdict might amount to. As we have tried to show, the answer to that question has not been provided by the sophisticated theoretical accounts given of the preponderance standard, but an answer may emerge from an understanding of the nature of litigation in which the preponderance standard is embedded. This does not mean that no such theoretical account could be given – after all, no matter how many white swans one sees, the next one might be black – but we doubt that one can be constructed. Still, after three hundred and fifty years, Fermat's conjecture was proven,[177] and perhaps something similar will occur with the conjunction paradox. What makes us doubtful is that Fermat's conjecture was about a formal system; the so-called conjunction paradox has its referent in real life. While some aspects of real life may be explainable in theoretical or algorithmic terms, much of it will not be, including much of the life of the law.

[177] *See* BARRY CIPRA, WHAT'S HAPPENING IN THE MATHEMATICAL SCIENCES 1995-1996 at 2-14 (Paul Zorn ed., 1996) (discussing the resolution of "the most famous problem in mathematics").