The Civil Standard of Proof Uncertainty: Probability, Belief and Justice

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1. *Introduction*

In many trials one of the court's most difficult tasks will be determining the facts. As evidence scholars have long recognised:

> The affairs of life allow only exceptionally of demonstration because they are generally concerned with transient actions which often are not clearly perceived or are reported by others. Accordingly the rights of men in civil life have to be determined on the basis of something less than demonstration, that is judgments of probability.[1]

An important question is therefore, on what basis should a court settle on a version of the facts? In civil cases the onus of proof is placed on the plaintiff, and it is commonly said that the plaintiff has to establish his or her case on the "balance of probabilities". But what precisely is meant by this expression? Is the plaintiff required to establish that his or her case is more probable than not? Or, is the plaintiff required to persuade the fact-finder of his or her version of facts? Both of these interpretations have judicial support. It might be thought that there was no difference between them, that evidence establishing that the plaintiff's case is more probable than not will necessarily be sufficiently persuasive. But recent academic debate reveals that the different formulations of the civil standard can produce very different results. Evidence may offer the plaintiff's case strong probabilistic support, without persuading the fact-finder, and vice versa.

In this paper it is argued that the reason that the civil standard of proof diverges from that mathematically prescribed is the fallibility of human probability judgments. Rationality dictates that in civil cases where the plaintiff and the defendant stand on an equal footing, a mathematical standard of 50 per cent should be adopted. The paper is divided into six sections. In the remainder of the first section it will be argued that, while probability judgments in forensic fact-finding rarely follow a mathematical process, they can be considered numerically. The second section raises the question whether the civil standard of proof should then be equated to a mathematical probability of 50

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1 Twining, W, "The Rationalist Tradition of Evidence Scholarship" in Campbell, E and Waller, L (eds), *Well and Truly Tried: Essays on Evidence* (1982) 211 at 215, discussing one of the first evidence texts, Gilbert, J, *The Law of Evidence* (1754).

per cent. There are strong policy arguments and High Court authority in favour of this interpretation. But there is also High Court authority that, to persuade a fact-finder, something more is required than merely probabilistic proof. It is unclear how this additional requirement may be satisfied.

The third section considers recent academic debate. Two hypothetical cases are considered which, some commentators argue, also reveal the inadequacy of mathematical proof. Neil Cohen's exploration of the additional requirement using confidence factors is considered, but found incoherent in a non-statistical context. In the fourth section the dissatisfaction with a purely mathematical standard is explained in terms of psychological theories of human probability judgment. While recognising the mathematical strength of evidence, humans prefer to make probability assessments through story construction. They therefore display a bias in favour of colourful detailed evidence and against dry mathematical proof. This account of juridical proof reveals the conjunction problem to be illusory. It is found that, unless there are considerations other than accuracy, it is irrational to reject a mathematical standard of proof.

The fifth section contains an examination of the arguments made against probabilistic proof on grounds of justice. They are found inadequate in that the same arguments could be levelled against many common types of evidence and processes of proof. In the sixth section it is concluded that the most weighty considerations of justice in the civil trial are accuracy and equality, which are best recognised through a mathematical standard of 50 per cent.

A. The Subjective Theory of Probability

The arguments presented in this paper proceed upon the basis that the probability judgments made in law trials can be viewed as mathematical probabilities. This is not immediately apparent. Yet it has been demonstrated that all coherent judgments of probability, in whatever field, can be translated into a numerical probability measurement.[2] The translation proceeds by way of a thought experiment in which the probability assessor is asked what odds they would accept if they were to bet on the event in question.[3] This is generally called the subjective theory of probability.[4]

Jonathan Cohen has questioned the validity of the betting analogy in the context of forensic fact-finding. He has suggested that it rests upon two fallacies. First, Cohen suggests that the betting analogy fails, since, in the judicial context, "the bet would be about a past event and would therefore be wholly unsettlable".[5] The analogy, he argues, totally breaks down, "betting on open-ended generalizations is hardly an appropriate activity for rational men".[6] Secondly, the odds a rational person would be prepared to accept would depend on

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2 Savage, L, *The Foundations of Statistics* (1954).

3 Tribe, L H, "Trial by Mathematics: Precision and Ritual in the Legal Process" (1971) 84 *Harv LR* 1329.

4 Mackie, J L, *Truth Probability and Paradox* (1973) at 230.

5 Cohen, L J, "Subjective Probability and the Paradox of the Gatecrasher" [1981] *Ariz St LJ* 627 at 630.

6 Cohen, L J, *The Probable and the Provable* (1977) at 27.

the amount at stake. "Bookmakers shorten the odds on a horse not only when they hear of its latest wins elsewhere but also when they begin to be concerned about how much they would lose if it won the current race."[7] Hence, the betting analogy does not appear to offer a particular value for the fact-finder's degree of belief, but a value that varies depending on the stake contemplated.

Cohen's objections can be met. His claim that people do not bet on open-ended generalisations is patently false. In politics, business and medicine, people judge probabilities and take action on the basis of their judgments, even though that may never discover the truth. In these situations, and in forensic fact-finding, it can accurately be said that the decision-maker is placing a bet, even though that bet may be unsettlable. Cohen's second objection is also misplaced. While the consequences of a forensic determination of facts may affect a fact-finder's determination of facts, they should not. In the context of a trial, the consequences of a determination should not affect a probability assessment, though they undoubtedly have a justified impact on the standard of proof. The subjective theory of probability may fail as a descriptive account of forensic fact-finding but this does not mean it cannot form the basis of a normative model.

This leads us to a further objection with the application of probability theory to forensic fact-finding. A number of commentators have suggested that the descriptive inadequacies of mathematical theory make it normatively irrelevant.[8] Admittedly it is futile prescribing a mathematical process of proof unachievable by a human fact-finder. Nevertheless, it will be argued in this paper that mathematical theory can usefully, albeit sparingly, be employed to improve human processes, and in particular should be used to set the civil standard of proof.

There remains one possible weakness with the betting analogy. In economics and gambling, the decision maker's goal is to maximise financial gain. In medicine the goal is to make accurate diagnoses and prescribe effective treatment. However, the forensic fact-finder's task is to judge people's conduct. Concepts of justice and fairness may enter the operations of the forensic fact-finder which are absent in the more mathematical spheres of economics, gambling and medicine. It may be appropriate in the judicial context to make probability judgments "on some criterion distinct from maximizing expected value".[9] This objection will be considered in the final chapter. In the meantime, however, there appear to be no reasons why probability judgments in the context of the trial should not be considered in mathematical terms.

2. *The Civil Standard of Proof: Probability or Persuasion?*

The question whether the plaintiff's evidence satisfies the standard of proof arises at least once in every civil trial. It is customary for the court to direct

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7 Id at 91.

8 Allen, R, "The Nature of Juridical Proof" (1991) 13 *Cardozo LR* 373 at 380; Callen, C R, "Cognitive Science and the Sufficiency of 'Sufficiency of the Evidence' Tests" (1991) 65 *Tul LR* 113.

9 Brilmayer, L and Kornhauser, L, "Review: Quantitative Methods and Legal Decisions" (1978) 46 *U Chi LR* 116 at 142.

the fact-finder to enter a verdict for the plaintiff only if the facts have been proved on the "balance of probabilities", or by "a preponderance of evidence". But, as Eggleston recently observed, "after centuries of fact-finding by judges, and by juries under their direction ... what is meant by these expressions is still a matter of debate".[10] In Australia, as in the United States, some authorities interpret these formulae as requiring the plaintiff to prove that the facts supporting each element of his or her case are "more probable than not". Other authorities reject a probabilistic interpretation in favour of a more subjective standard founded on the fact-finder's belief, satisfaction or persuasion.

A. More Probable Than Not

There is much support for the view that the plaintiff in ordinary civil cases is required to establish that the facts supporting her or his claim are more probable than not.[11] In mathematical terms, this formulation appears to set for the plaintiff a probability threshold of 50 per cent.[12] This interpretation has a solid basis in policy. A standard of 50 per cent can be expected to maximise the number of correct decisions.[13] It also recognises the equality of the parties before the law.[14] It is as easy for the plaintiff to prove her or his case as it is for the defendant to disprove it (except that the onus of proof, which must be placed somewhere, is placed on the plaintiff), and an error against either party is treated as equally regrettable.

B. An Additional Element: Actual Persuasion

The uncertainty about the civil standard is evident in a number of American and Australian judgments. In these cases there was little evidence before the court, and though the evidence may have been mathematically strong, members of the court expressed dissatisfaction with a purely probabilistic formulation:

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10 Eggleston, R, *Evidence, Proof and Probability* (2nd edn, 1983) at 129; cf Eggleston, R, "The Probability Debate" [1980] *Crim LR* 678 at 680.

11 For example, *Utting v Luhtala* (1984) 55 ALR 261 at 264 per Gibbs CJ, Murphy, Wilson, Brennan and Deane JJ agreeing; *Host v Bassett* (1983) 57 ALJR 681 at 682 per Gibbs CJ, Wilson, Deane and Dawson JJ; *West v Government Insurance Office of New South Wales* (1981) 148 CLR 62 at 69–70 per Murphy J (hereinafter *West v GIO*); *TNT Management Pty Ltd v Brooks* (1979) 23 ALR 345 at 351–4 per Murphy J (hereinafter *TNT v Brooks*); *Goodwin v The Nominal Defendant* (1979) 54 ALJR 84 at 86 per Stephen, Mason, Murphy, Aickin and Wilson JJ; *Livingstone v Halvorsen* (1978) 53 ALJR 50 at 59 per Aickin J; *Anchor Products Ltd v Hedges* (1966) 115 CLR 493 at 501 per Owen J; *Jones v Dunkel* (1959) 101 CLR 298 at 309–10 per Menzies J, at 319 per Windeyer J; *Bradshaw v McEwans Pty Ltd*; Unreported, High Court of Australia, 27 April 1951, per Dixon, Williams, Webb, Fullagar and Kitto JJ, applied in *Holloway v McFeeters* (1956) 94 CLR 470 at 480–1 per Williams, Webb and Taylor JJ; *Luxton v Vines* (1952) 85 CLR 352 at 358–9 per Dixon, Fullager and Kitto JJ; at 362 per McTiernan J; *Davis v Bunn* (1936) 56 CLR 246 at 267 per Evatt J. Compare with *Davies v Taylor* [1974] AC 207 at 219 per Lord Simon.

12 Murphy J of the High Court of Australia, and Lord Simon of the House of Lords have adopted explicitly mathematical formulations.

13 For a proof, see Kaye, D, "Naked Statistical Evidence" (1980) 89 *Yale LJ* 601 at 605, n19.

14 *Re Winship* 397 US 358 (1970) at 370–2; cf Ligertwood, A, "The Uncertainty of Proof" (1976) 10 *MULR* 367 at 368–70; above n3 at 1378–86.

> The truth is that, when the law requires the proof of any fact, the tribunal must feel an actual persuasion of its occurrence or existence before it can be found. It cannot be found as a result of a mere mechanical comparison of probabilities independently of any belief in its reality.[15]

How does this formulation differ from the probabilistic formulation? One view is that it simply sets a higher mathematical standard of proof; the fact-finder "must be persuaded that the truth of the fact is not merely more probable than not, but highly probable".[16] The difficulty with this interpretation is that the judges favouring the "actual persuasion" standard appear to be contrasting it with the mathematical standard. It should also be noted that the judges expressing dissatisfaction with a purely probabilistic formulation, have at other times endorsed it.[17] This suggests that the requirement of "belief" is of a different nature, but is ordinarily satisfied where the probabilistic standard is met. Only in certain cases, where the evidence is sparse, is the probabilistic standard satisfied without persuading the fact-finder.

What might this extra requirement be? The words used in describing it — "persuasion", "belief", "satisfaction" — seem to signify the mental process of accepting the conclusion, in contrast with the "more probable than not" formulation which says something about the strength of the evidence. Not surprisingly, many commentators have been critical of such a requirement. Juridical proof should be concerned with the strength of evidence and not the sensibilities of the fact-finder. If the fact-finder refuses to accept evidence favouring the plaintiff's case, is it not behaving irrationally?[18] A further difficulty is the uncertainty of this requirement.[19] What must the plaintiff do to secure the fact-finder's belief in addition to presenting mathematically strong evidence?

Perhaps we can gain further understanding of the "belief" requirement by considering the following explication of Kitto J:

> One does not pass from the realm of conjecture into the realm of inference until some fact is found which positively suggests, that is to say provides a reason, special to the particular case under consideration, for thinking it

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15 *Briginshaw v Briginshaw* (1938) 60 CLR 336 at 361 per Dixon J, applied in *Luxton v Vines*, above n11 at 363–4 per Webb J. Compare with Dixon J in *Briginshaw v Briginshaw*, above n11 at 362; *Holloway v McFeeters*, above n11 at 488 per Kitto J; *Jones v Dunkel*, above n11 at 304–5 per Dixon CJ, applied in *West v GIO*, at n11 at 66 per Stephen, Mason, Aickin, and Wilson JJ; *Murray v Murray* (1960) 33 ALJR 521 at 524 per Dixon CJ; *State Government Insurance Commission v Laube* (1984) 37 SASR 31 (hereinafter *SGIV v Laube*). Compare with *Sargent v Massachusetts Accident Company* 29 NE2d 825 (1940) at 827 per Lummus J, applied in *Smith v Rapid Transport* 58 NE2d 754 (1945) at 755.

16 Cleary, E, *McCormick on Evidence* (3rd edn, 1984) at 958.

17 The two strongest opponents of the probabilistic standard, Dixon CJ and Kitto J, have on one occasion adopted it: *Luxton v Vines*, above n11 at 358–9. Stephen, Mason, Aicken and Wilson JJ in *West v GIO*, above n11 at 66 adopted Dixon CJ's formulation from *Jones v Dunkel*, above n11 at 304–5, but applied the "more probable than not" formulation in *Goodwin v The Nominal Defendant*, above n11 at 86.

18 Above n16 at 958; Brook, J, "The Use of Statistical Evidence of Identification in Civil Litigation: Well-Worn Hypotheticals, Real Cases, and Controversy" (1985) 29 *St Louis U LJ* 293 at 303; Ligertwood, above n14 at 389.

19 Cohen, L J, "The Logic of Proof" [1980] *Crim LR* 91 at 100.

> likely that in that actual case a specific event happened or a specific state of affairs existed.[20]

There are two aspects of this passage which deserve comment. First, what does Kitto J mean in referring to a reason "special to the particular case"? A number of commentators have spoken in similar terms, and a fuller discussion this point appears in Part 4. For the moment, however, let us consider the inconsistency that Eggleston revealed between this comment and res ipsa loquitur cases where there is no direct evidence of the cause of the injury.[21] The court refers explicitly to their experience of accidents of that type, and if "in the ordinary course of human affairs, such an occurrence is unlikely without want of care on the part of a person in the situation of the defendant" then the fact-finder is entitled to infer negligence.[22] This is so, "whether or not there is evidence of specific acts or occurrences which could be found to be negligent".[23] The clear inconsistency between Kitto J's comments, and the res ipsa loquitur reasoning would perhaps be acceptable if the latter were a special rule applied in particular cases. But it is not. It is simply "a process of logic by which an inference of negligence may be drawn from the circumstance of the occurrence itself".[24]

To add further to the untidiness, both in *Jones v Dunkel* where Kitto J made these remarks, and in *TNT v Brooks* where Gibbs J referred to them with approval,[25] the judges made a finding of negligence by applying precisely the style of reasoning they had condemned. These cases arose out of head-on collisions to which there were no surviving credible eyewitnesses; the only available evidence was of the road conditions, the directions the vehicles were travelling and "the position and state of the vehicles after the collision".[26] Kitto and Gibbs JJ said that they would not rely upon "general considerations as to the likelihood of negligent conduct occurring in the conditions which existed at the time and place of the collision",[27] but how else could they have found negligence? Facts can only be inferred from circumstantial evidence of this kind by drawing on knowledge derived from experience of similar situations. Where there is no witness available to give a direct account of what occurred, reference to such "general considerations" is unavoidable.

The second aspect of Kitto J's remarks that deserves comment is the distinction that he draws between "conjecture" and "inference". Dixon CJ spoke in similar terms. He said that "the law ... does not authorise a court to choose between guesses, where the possibilities are not unlimited, on the ground that one guess seems more likely than another or the others".[28] It is difficult, however,

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20 *Jones v Dunkel*, above n11 at 305 per Kitto J, applied in *TNT v Brooks*, above n11 at 350 per Gibbs J, Stephen, Mason and Aicken JJ agreeing.

21 Eggleston, R, "Probabilities and Proof" (1963) 4 *MULR* 180 at 202–4.

22 *The Nominal Defendant v Haslbauer* (1967) 117 CLR 448 at 452 per Barwick CJ.

23 *Government Insurance Office of NSW v Fredrichberg* (1968) 118 CLR 403 at 413 per Barwick CJ, Kitto J agreeing.

24 Ibid.

25 Above n20.

26 *Jones v Dunkel*, above n11 at 306 per Kitto J; see also *TNT v Brooks*, above n11 at 350 per Gibbs J, Stephen, Mason and Aicken JJ agreeing.

27 *Jones v Dunkel*, above n20.

28 *Jones v Dunkel*, above n11 at 305 per Dixon CJ, applied in *West v GIO*, above n11 at 66

to understand the distinction that Kitto J and Dixon CJ are seeking to draw. As they recognised themselves in an earlier case:

> [I]f circumstances are proved in which it is reasonable to find a balance of probabilities in favour of the conclusion sought then, though the conclusion may fall short of certainty, it is not to be regarded as a mere conjecture or surmise.[29]

In summary, it appears that, according to a number of judges on the High Court, it is insufficient for a plaintiff to merely establish that his or her version of the facts is more probable than not. The plaintiff must also induce in the mind of the fact-finder a belief in this version of the facts. It is not possible to draw from these judgments a more precise description of what the additional requirement entails. However, when the fact-finder reaches this state of mind, it will appear to it that the evidence is special to the particular case,[30] and that the plaintiff's version of facts is an inference from the evidence, and not mere conjecture.

C. Civil Cases of Greater Gravity

There is general agreement that in certain civil cases where the consequences for the defendant are of greater gravity it is appropriate that a higher standard of proof be applied.[31] Two explanations have been offered for this higher standard, both of which can be interpreted mathematically. It follows that the discussion of the two formulations of the ordinary civil standard, in the rest of this paper, has application also to civil cases of greater gravity.

The first explanation for the higher standard in serious cases is that more serious charges are less likely to be well founded; people are less likely to commit a fraud than they are to make a negligent misrepresentation.[32] The civil standard on this explanation may remain at the same mathematical level of 50 per cent. It is just that, taking account of the initial unlikelihood of the plaintiff's version of the facts, it takes more evidence for the plaintiff to reach this level. The way in which an initial assessment of probability, or prior probability, should be modified to take account of new evidence is governed by Bayes' Theorem.[33]

It has been suggested that this assumption underlying this account of proof in civil cases of greater gravity is not always well founded. Consider a case such as *Helton v Allen*[34] where the issue was whether the defendant, a beneficiary under a will, had murdered the testatrix. If a finding of murder was

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per Stephen, Mason, Aickin, and Wilson JJ.

29 *Bradshaw v McEwans Pty Ltd*, above n11, applied in *Luxton v Vines*, above n11 at 358 per Dixon, Fullager, Kitto JJ and *TNT v Brooks*, above n11 at 350 per Gibbs J, Stephen, Mason and Aicken JJ agreeing.

30 *Jones v Dunkel* above n20.

31 For example, *R v Jenkins; ex parte Morrison* [1949] VLR 277, affirmed by the High Court, *Morrison v Jenkins* (1950) 80 CLR 626, the "whose baby" case, where according to Eggleston, the court "adopted a standard of proof higher than that required in a criminal case of the most serious character": above n21 at 208.

32 *Briginshaw v Briginshaw*, above n15 at 362 per Dixon J; *Neat Holdings Pty Ltd v Karajan Holdings Pty Ltd* (1993) 1 *Leg Rep* 1.

33 Lempert, R, "Modelling Relevance", 75 *Mich LR* (1977) 1021 at 1025; cf above n18 at 320–1.

34 (1940) 63 CLR 691.

made, the defendant beneficiary would lose his entitlements under the will. If the issue was whether the testatrix had been killed deliberately or by accident, the low incidence of murder may suggest a low prior probability. If, however, there was no doubt that the testatrix had been murdered, and the sole issue was the identity of the killer, then it may be thought that the prior probability was not particularly low (perhaps one divided by the number of beneficiaries).[35] There are two responses to this argument. The first is that the prior probability advanced in the second case, where murder had been established, is not a true prior probability. If murder has been established, then evidence particular to the case has been taken, and the court has moved beyond the prior probability. The court's starting point may still have been a low prior probability before any evidence particular to the case was taken, reflecting the relatively low incidence of murder in the community. A second response is that the low prior probability may be more than a statement of fact. It may be a policy derived from the criminal law — the presumption of innocence.[36]

The second explanation is that "the seriousness of the allegation [and] the gravity of the consequences flowing from a particular finding" are to be taken into account in determining the standard of proof.[37] In an ordinary civil case the court decides which of two private parties should bear the financial loss arising out of the events under consideration. As far as the court is concerned, the two parties have the same to lose, and it should consider an error in either direction as equally regrettable. In these circumstances, it is appropriate to set a standard of proof at a probability level of 50 per cent, making it as easy for the plaintiff to prove his or her case as it is for the defendant to disprove it. However, where a more serious allegation is involved, such as fraud or murder, the defendant has more to lose than the plaintiff. Some degree of moral blame attaches to a finding against the defendant with the risk of damaging the defendant's reputation, employment prospects, etc. In these circumstances, the court would consider an erroneous verdict against the defendant more seriously than one against the plaintiff. This makes a standard of greater than 50 per cent appropriate. While a higher standard increases the expected total number of incorrect decisions, it decreases the number of expected incorrect findings against the defendant. These considerations can be modelled mathematically. Given a numerical measure of the relative regret associated with an erroneous verdict in either direction, an appropriate threshold of proof can be set.[38]

If one had to choose between these explanations for the higher civil standard, the second may be found to have greater support. The courts often talk in terms of the "gravity" or "seriousness" of the allegations rather than their "unlikelihood".[39] And it has actually been suggested that the standard in such cases gets raised to a "higher degree of probability".[40] However both explanations are

35 Australian Law Reform Commission, Evidence Reference, Research Paper No 14: *Aspects of Proof* (1982) ALRC, Canberra at 21.

36 *Briginshaw v Briginshaw*, above n15 at 363 per Dixon J.

37 Id at 362.

38 Kaplan, J, "Decision Theory and the Factfinding Process" (1968) 20 *Stan LR* 1065 at 1066–83; above n3 at 1378–93; Ligertwood, above n14 at 368–70.

39 *Briginshaw v Briginshaw*, above n15 at 343–4 per Latham CJ; *Rejfek v McElroy* (1965) 112 CLR 517 at 521 (full court); *Hornal v Neuberger Products Ltd* [1957] 1 QB 247 at 266.

40 *Bater v Bater* [1951] P 35 at 37–8 per Denning LJ; endorsed by Lord Scarman in *R v*

credible, and they are quite consistent with each other. What is of importance to this paper is that they are both consistent with a mathematical standard of proof.

3. *Gatecrashers, Blue Buses and Mathematical Probabilities: The Academic Debate*

In the last two decades, evidence scholars in the United States, England and Australia have hotly debated the applicability of mathematical probability theory to the law of evidence. Much of the debate has centred on two hypothetical civil cases where the plaintiff's evidence establishes that it is mathematically "more probable than not" that the defendant is liable, but a finding against the defendant is perhaps counter-intuitive. These hypotheticals raise precisely the same issue discussed in the first chapter. Is it enough for the plaintiff to establish that their case is mathematically more probable than not, or is something more required?

One hypothetical case, known as the Gatecrasher case,[41] concerns a rodeo at which 1 000 seats were taken, but only 499 seats were paid for. The rodeo owner brings an action against one of the spectators, chosen at random. On the evidence of the attendance figures alone it is more probable than not that the defendant was a gatecrasher, but would a court reach this verdict?

The other hypothetical case is known as the Blue Bus case.[42] An unidentified bus sped through a red light knocking over a pedestrian at a crossing. There are only two bus companies in town, the Blue Bus Company with 80 buses and the Green Bus Company with 20 buses. The pedestrian brings a negligence action against the Blue Bus Company. On this evidence alone it appears that there is an 80 per cent probability that the Blue Bus Company was responsible for the accident, but would the plaintiff succeed?

Much of the debate has proceeded on the assumption that the plaintiffs would not succeed in these cases. For example, Brilmayer has said, "of course the law would not allow recovery in either of these cases".[43] However some commentators have questioned this assumption.[44] If these cases reached the High Court it appears quite possible from the authorities discussed in the preceding section that some judges, at least, would find the evidence insufficiently persuasive.

Interestingly, the American case of *Kaminski v Hertz*[45] has facts quite similar to the Blue Bus case, and provides some indication of how a court might deal with such a case. The plaintiff was injured by a yellow truck with a Hertz logo on the side. The plaintiff was unable to give any further identification

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Home Secretary, Ex parte Khawaja [1984] AC 74 at 112–4.

41 Above n6 at 75.

42 Above n3 at 1340–1, 1346–50.

43 Brilmayer, L, "Second-Order Evidence and Bayesian Logic" in Tillers, P and Green, E (eds), *Probability and Inference in the Law of Evidence: The Uses and Limits of Bayesianism* (1988) 147 at 149.

44 For example, Eggleston (1980), above n10 at 681; cf Lempert, R, "The New Evidence Scholarship: Analysing the Process of Proof" in Tillers and Green, id, 61at 73.

45 288 NW 2d 426 (1979).

of the truck. As it happened, Hertz owned only 90 per cent of the trucks meeting this description. And so with no further evidence, there would be a 90 per cent probability that the truck that injured the plaintiff belonged to Hertz.

These facts were presented to two courts and their judgments provide a further illustration of the civil standard of proof uncertainty. The trial judge dismissed the plaintiff's case summarily, saying a verdict for the plaintiff would be based upon "guess and conjecture".[46] However, the Michigan Court of Appeal reversed this finding and remanded for trial, holding that the

> Hertz color scheme and logo establish a prima facie showing of ownership or control sufficient to prevent a summary judgment ... The named firm may introduce evidence indicating lack of control or ownership. But such explanations are for the jury to evaluate and appraise in light of all the surrounding circumstances.[47]

A. Reconciling a Finding for the Defendant with the Mathematical Standard

A number of attempts have been made to reconcile a finding for the defendant in the hypotheticals with the "more probable than not" formulation of the standard of proof. One argument is that the plaintiff's failure to adduce more detailed evidence itself strengthens the defendant's case. An adverse inference is raised against the plaintiff, reducing the probability of her or his version of facts below the 50 per cent threshold.[48] In Australia this would be an application of the rule in *Jones v Dunkel*.[49]

There are a number of problems with this explanation. First, the principle relied upon, in Australia at least, is not strong enough to assist the defendant in the hypotheticals. While there is now little doubt that the rule can be invoked by the defendant,[50] as well as by the plaintiff, the rule in *Jones v Dunkel* can still be invoked only in certain circumstances, and then has a narrowly defined operation. The defendants would have to identify a witness that the plaintiff would have been expected to call, but failed to call without explanation.[51] This failure may lead the fact-finder to more readily believe the defendant, or strengthen the inferences favouring the defendant, but it would not directly damage the plaintiff's case.[52] In the hypotheticals, the defendant has adduced no evidence, and there are no inferences favouring the defendant, upon which the rule could operate. Hence, the plaintiff's version of facts would remain more probable than not.

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46 Id at 427.

47 Ibid.

48 Above n3 at 1349. See Kaye, D, "The Paradox of the Gatecrasher and Other Stories" [1979] *Ariz St LJ* 101 at 106–8.

49 Above n11.

50 *Brandi v Mingot* (1976) 12 ALR 551 at 560; Byrne, D M and Heydon, J D, *Cross on Evidence* (3rd Aust edn, 1986) at 38.

51 *Payne v Parker* [1976] 1 NSWLR 191 at 201 per Glass JA; cf *R v Burdett* (1820) 4 B & Ald 95 at 161–2; 106 ER 873 at 898 per Abott CJ, applied in *Jones v Dunkel*, above n11 at 321–2 per Windeyer J.

52 *Jones v Dunkel*, above n11 at 312 per Menzies J, at 321–2 per Windeyer J; cf *Brandi v Mingot* (1976) 12 ALR 551.

What if the rule in *Jones v Dunkel* operated more broadly? In the United States, in the case of missing evidence the court may infer that "the testimony, if produced, would be unfavourable".[53] But even then, the rule would fail to offer an adequate explanation for the assumed result in the hypotheticals. First, one may doubt whether the rule would, for example, explain the finding for the defendant in the Blue Bus case, where the plaintiff's bus ownership evidence establishes an initial probability of 80 per cent.[54] Secondly, the rule would not apply to cases like *Kaminski v Hertz*[55] where there is no further evidence available to the plaintiff.[56]

A final weakness with this explanation is that the same line of argument would be available to the plaintiff.[57] In the Blue Bus case the court might expect the Blue Bus Company to call as witnesses the drivers operating in the vicinity of the accident that night, and in the Gatecrasher case, one would expect the defendant to testify that he or she had paid. At the end of the plaintiff's case the fact that this evidence is in the defendant's rather than the plaintiff's domain is a circumstance which may count in the plaintiff's favour in the court's assessment of the sufficiency of the plaintiff's evidence;[58] and if the defendant failed to present this evidence, *Jones v Dunkel* could be invoked against him or her.

A second argument defending the "more probable than not" interpretation is that, while the civil standard equates to a threshold of 50 per cent in most cases, the hypotheticals are a special class of case where a higher standard of proof is justified. Denying the plaintiff compensation in such cases would give plaintiffs in future cases the incentive to present more evidence, leading to greater accuracy in the long term.[59]

This argument, like the first, has a number of weaknesses. First, the rule relies upon its notoriety for its effectiveness. If litigants were unaware of its existence they would lack the incentive to obtain more evidence than is ordinarily required. The rule would then have the effect of reducing rather than increasing the accuracy of the court's fact-finding. Yet for a rule which relies upon notoriety for its effective operation, the incentive rule is decidedly obscure. Its advocates[60] have cited no authorities in its support.

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53 *Graves v United States* 150 US 118 (1893) at 121; cf above n16 at 804-9; *Wigmore on Evidence* (Chadbourn Revision, 1979) Vol 2, at 192–214; cf Lindley, D and Eggleston, R, "The Problem of Missing Evidence" (1983) 99 *LQR* 86.

54 Allen, R, "Analyzing the Process of Proof: a Brief Rejoinder" (1988) in Tillers and Green, above n43, 103 at 106; cf Brook, J, "Inevitable Errors: The Preponderance of the Evidence Standard in Civil Litigation" (1982) 18 *Tulsa LJ* 79 at 99–100.

55 Above n45.

56 Above n3 at 1349; Kaye D, "The Laws of Probability and the Laws of the Land" (1979) 47 *U Chi LR* 34 at 40; above n48 at 106; above n13 at 610–1.

57 See Allen, R, "A Reconceptualization of Civil Trials" in Tillers and Green, above n43, 21 at 30; Cohen, N, "Confidence in Probability: Burdens of Persuasion in a World of Imperfect Knowledge" (1985) 60 *NYULR* 385 at 396.

58 *De Gioia v Darling Island Stevedoring* (1941) 42 SR (NSW) 1 at 4 per Jordan CJ, at 11–12 per Davidson J; *Morgan v Babcock & Willcox Ltd* (1929–30) 43 CLR 163 at 178 per Isaacs J; *Parker v Paton* (1941) 41 SR (NSW) 237 at 243; *Hampton Court v Crooks* (1957) 97 CLR 367 at 371 per Dixon CJ.

59 Above n56.

60 Ibid.

Secondly, one might question whether such a rule accords with conceptions of justice. It appears to sacrifice the interests of the plaintiff before the court for the sake of litigants in other cases. But, as Jonathan Cohen has commented in a different context:

> [E]ach individual has a right to his [sic] day in court, when his interests are touched by the possibility of litigation; and the task of the court ... is to deal out justice between the contending parties in each suit that comes before it.[61]

Furthermore, the incentive rule postulated here would operate in a very similar fashion to the rule in *Jones v Dunkel*. It could sensibly be applied only to cases where there was other evidence available to the plaintiff, but not adduced, and in such cases it would have the effect of penalising the plaintiff. As an explanation for the assumed mismatch between the mathematical standard and the hypothetical cases, the incentive rule is open to the same criticisms as the *Jones v Dunkel* rule. It does not appear to explain the Blue Bus case, where the plaintiff's case is probabilistically strong. Moreover, the rule fails to explain cases such as *Kaminski v Hertz*[62] where no further evidence is available. And why should the same rule not operate against the defendant also; to give the defendant the incentive to present further evidence which in the hypotheticals appears reasonably open to him or her?

Some commentators have criticised these defences of a mathematical standard for contemplating the existence of additional evidence. This is seen "as an attempt to explain away [their] troublesome aspects ... by implicitly rejecting them". [63] But this criticism is unjust. The hypotheticals in their initial form were very thin on their facts and it was natural to ask why no other evidence was adduced and how further evidence could be encouraged.[64] Yet the answers to these questions have failed to reconcile a finding for the defendants in the hypotheticals with the "more probable than not" standard. The hypotheticals, like the series of High Court decisions discussed above, reveal an uncertainty about the operation of the civil standard of proof. Is it enough that the plaintiff establish that her or his case is more probable than not, or is something more required? What justification could there be for an additional requirement which treats the parties unequally, and leads to a greater number of incorrect decisions?

B. Measuring the Quantity of the Evidence

A distinctive feature of both the hypothetical cases and the collision cases decided by the High Court is their dearth of evidence. This feature formed the basis of the two attempts to reconcile the hypotheticals with the "more probable than not" standard discussed above: the argument that an adverse inference operates against the plaintiff for failing to adduce further evidence, and the argument that by denying the present plaintiff compensation, future plaintiffs would be encouraged to present a greater quantity of evidence, leading to an increase in long term accuracy.

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61 Above n6 at 120.
62 Above n45.
63 Above n57 at 30.
64 See above n44 at 75; Eggleston (1983), above n10 at 41.

A number of commentators have suggested that further investigation of this feature may lead to a resolution of the uncertainty surrounding the civil standard of proof.[65] They have, however, stumbled at the outset on the theoretical difficulty of finding a sensible measure of "quantity of evidence" other than the traditional mathematical probability.

Neil Cohen purports to have overcome this difficulty with a statistical interpretation of the standard of proof which incorporates the traditional mathematical interpretation and extends it in a second dimension. According to Cohen, the fact-finder, when presented with a body of evidence, first determines how probable the evidence renders the plaintiff's version of facts, and secondly, by considering the quantity of evidence before them, the fact-finder measures their confidence in this determination.[66]

Cohen draws an analogy with statistical sampling methods. Suppose we have a large vat of black and white marbles. If we drew 50 marbles of which 30 were white, we would estimate that there would be a 60 per cent probability that the next marble to be drawn would be white. If we drew 100 000 marbles and 60 000 were white, we would form the same conclusion, but with much more confidence in this estimate. Statistical methods can measure the confidence in cases such as these with a great deal of accuracy.[67]

Cohen suggests that the concept of confidence explains the expected results in the hypotheticals; while the evidence renders the plaintiff's case more probable than not, "we cannot say with sufficient confidence that the true probability of liability exceeds 0.5".[68] In the Gatecrasher case, the probability of 50.1 per cent from the attendance figures is not the "true probability", because:

> Absent from this determination is a great deal of information beyond the overall proportion of gatecrashers in the rodeo crowd. For example, does the defendant have a witness who can testify that he or she saw the defendant purchase a ticket? What is the defendant's reputation for honesty?[69]

Cohen argues that with the statistical concept of confidence he has constructed "a more realistic probabilistic formulation of the civil standard of proof".[70] His theory, he claims, also explains the very non-mathematical judicial statements which talk of the need for an "actual belief":[71] "[T]hese references can be understood as unfocused attempts to describe the concept of confidence".[72]

Cohen's theory applies quite readily to the cases he hypothesises which present sampling problems and have purely statistical issues in dispute, and he is able to discuss these at some length.[73] His "confidence" concept has a well recognised definition in such a context, and the "true probability" is itself a

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65 Above n6; above n44 at 76–80; Birmingham, R and Dunham, N, "An Evidentiary Reading of Naked Statistical Proofs" (1987) 13 *St Louis ULJ* 797 at 813–4; above n43 at 156–9.

66 Cohen, above n57 at 399.

67 Id at 399–404.

68 Id at 407.

69 Ibid.

70 Id. at 386

71 *Sargent v Massachusetts Accident Company*, above n15.

72 Cohen, above n57 at 420.

73 Id at 398–408; Cohen, N, "Conceptualizing Proof And Calculating Probabilities: A Response to Professor Kaye" (1987) 73 *Cornell LR* 78 at 83–4, 88–91.

statistic. However, Cohen gives little guidance as to how his theory applies to non-statistical cases. In a case such as the Blue Bus case, what is the "true probability" that Cohen alludes to? Cohen fails to adopt a consistent definition for this concept that lies at the core of his theory.

At one point Cohen suggests that the "true probability" is "based on all possible evidence".[74] Is Cohen referring here to ideal evidence, such as the testimony of a hypothetical, wholly reliable and creditworthy eyewitness? But ideal evidence in the hypotheticals, unlike Cohen's sampling hypotheticals, would provide us with certainty, rather than a probability. As Cohen himself recognised at a different point, "[i]f one knew all the possible information concerning an event, it would be meaningless to speak of probabilities ... if one had perfect information ... one could predict with certainty".[75] On this interpretation of "true probability" Cohen's interpretation of the civil standard would then merge with the traditional one-dimensional probabilistic standard. The fact-finder would simply be required to have a sufficient level of confidence that the true facts were as the evidence indicated. In the Gatecrasher case, the fact-finder would be 50.1 per cent confident that the defendant was in truth a gatecrasher. If Cohen is dissatisfied with this result he is merely advocating a higher one-dimensional standard of proof.

At a second point Cohen states that the "true probability" is based upon "the totality of all available evidence".[76] But if this is what Cohen means, his theory runs into other difficulties. First, his theory would resemble the rule in *Jones v Dunkel*, and the incentive rule, penalising the plaintiff for failing to adduce enough available evidence. Would Cohen's standard share with these rules the inadequacies outlined earlier?

Presumably one distinction in Cohen's model is that the fact-finder would feel less confidence in its assessment whether it was the plaintiff or the defendant that failed to adduce further available evidence, and whatever the explanation for this failure. This would overcome one limitation with the *Jones v Dunkel* and incentive-rule explanations. However one might question the justice of penalising the plaintiff for the defendant's failure to adduce evidence, and Cohen's version of this rule does not accord with the legal position discussed above. Furthermore, Cohen's theory would still fail to account for cases like *Kaminski v Hertz*[77] where further evidence is simply not available. Cohen recognised this as a flaw with Tribe's adverse inference explanation[78] but failed to see that his own theory suffered the same weakness. And how adequate an explanation is Cohen's theory for a case like the Blue Bus case where the evidence adduced initially lends very strong probabilistic support to the plaintiff's case?

A third interpretation of Cohen's theory is that the "true probability" is an assessment based upon some other amount of evidence between the available evidence and ideal evidence. But his theory is then entering the realm of conjecture. Whether or not the "true probability" would point in a different direction

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74 Cohen, above n57 at 399.
75 Id at 397.
76 Above n73 at 85.
77 Above n45.
78 Cohen, above n57 at 395–6.

to the estimate would depend upon what unavailable evidence the fact-finder chose to imagine.

A fourth interpretation is that Cohen is suggesting that the court merely counts the number of pieces of evidence before it. Perhaps this is what Cohen meant in saying "the precision of a subjective probability derived in the legal context is a function of the quantity of information upon which it is based".[79] This interpretation has, at least, the merit of simplicity. However, it is not consistent with court practice. Fact-finders often place a great deal of confidence in a single eyewitness identification. In fact, in the past, too much weight has been placed on such evidence, leading to tragic errors, and the introduction of a requirement that the juries be warned against this risk.[80]

Cohen's model is incapable of describing or justifying how fact-finders apply the civil standard of proof. The analogy with statistical theory has no application to non-statistical cases; the statistical concepts lose their meaning and his theory raises more questions than it answers. This assessment of Cohen's theory is perhaps not surprising. Why should the statistical concept of confidence, with its narrow application to sampling problems, offer insights into the processes of human reasoning? To understand human reasoning, one should rely more on the findings of psychologists, cognitive scientists and philosophers and less on the findings of statisticians. Cohen suggests that judicial statements which talk of the need for an "'actual belief ...' can be understood as unfocused attempts to describe the concept of confidence".[81] In the next chapter it will become apparent that, on the contrary, Cohen's concept of confidence is an unfocused attempt to describe the way people form beliefs.

4. *Human Probabilistic Assessment: Preferences and Biases*

The most recent development in the debate about the mathematical theory and evidence law could be described as a humanistic backlash against what is perceived as misplaced mathematicism. Some within this school, which may be part of the broader post-modern movement,[82] argue that mathematics fails to take account of the requirements of justice. These arguments will be considered in the next section. Other commentators focus on the divergence between human and mathematical reasoning and argue that mathematical prescriptions are irrelevant.[83] In this paper it is argued that these commentators are moving the debate in the right direction, but are in danger of going too far. By providing a more complete descriptive account of forensic proof they are giving necessary depth to the "new evidence scholarship"[84] but they should not reject the normative insights that mathematical theory can provide.

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79 Id at 398.

80 *Cross*, above n50 at 55.

81 Cohen, above n57 at 420; referring to *Sargent v Massachusetts Accident* above n15.

82 See Meehan, M, "Law and Literature: Reworking the Master-Plot", in Ruthuen, K (ed), *Beyond the Disciplines: The New Humanities* (1992) 109 at 110 n2.

83 Callen, above n8; Allen, above n8; Hirshman, L R, "It Will be Pleasanter to Tell You a Story" (1991) 13 *Cardozo LR* 445.

84 See Twining, W, "The New Evidence Scholarship" (1991) 13 *Cardozo LR* 295.

A. Psychological Findings

This section examines a series of experiments with an interesting resemblance to the Blue Bus case. These and other experiments reveal that people do not assess evidence mathematically, but employ a number of simplifying processes, or heuristics. "In general, these heuristics are quite useful, but sometimes they lead to severe and systematic errors".[85] It will be argued that a mathematical standard of proof should be adopted in preference to the subjective "belief" formulation in an attempt to remedy this predictable human error.

Experiment 1: Direct Identification Evidence and Incidental Base Rate Data

The subjects were given the following information:[86] A cab was involved in a hit and run accident at night. Eighty-five per cent of the cabs in the city that night were green, and 15 per cent were blue. A witness identified the cab as blue. The reliability of the witness was tested in conditions similar to those of the sighting and it was discovered that they gave a correct identification 80 per cent of the time.

In relation to this experiment, the cab ownership figures can be described as incidental base rate data. They are termed "base rate" because they have equal application to all the cab accidents in the town. They are incidental in that there is no causal link with the accident; in no way do they provide an explanation why the accident occurred. The witness identification is direct in that, if accepted, it provides a conclusive answer to the question in point.

The subjects were asked to give the probability that the cab involved in the accident was blue rather than green. Most subjects said that there was a probability of 80 per cent that the cab was blue. They apparently took account only of the reliability of the witness, and ignored the cab ownership data. The mathematically correct answer is that there is a 41 per cent probability of the cab being blue. This may be calculated as follows. Imagine that the witness observed 100 such accidents. One would expect that 85 of the accidents were caused by green cabs, and that 15 accidents were caused by blue cabs. Out of the 85 green accidents, the witness would be expected to make 68 correct identifications of the cab as green (80 per cent of 85), and 17 incorrect identifications of the cab as blue (20 per cent of 85). Out of the 15 blue accidents, the witness would be expected to make 12 correct identifications of the cab as blue (80 per cent of 15), and three incorrect identifications of the cab as green (20 per cent of 15). Hence one would expect the witness to identify a cab as blue in 29 cases (12 plus 17), out of which one would expect 12 identifications to be correct. Therefore the probability of a blue identification being correct is 41 per cent (12 divided by 29). This is an application of Bayes' Theorem.

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85 Tversky, A and Kahneman, D, "Judgment under Uncertainty: Heuristics and Biases" in Kahneman, D, Slovic, P and Tversky, A (eds), *Judgment under Uncertainty: Heuristics and Biases* (1982) 3; cf Saks, M and Kidd, R, "Human Information Processing and Adjudication: Trial by Heuristics" (1980) 15 *L & Soc R* 123.

86 Tversky, A and Kahneman, D, "Evidential Impact of Base Rates" in Kahneman et al, id, 153 at 156–7.

A common objection to this solution of the problem is that the cab ownership figures have nothing to do with the accuracy of the witness.[87] This is quite right. But the cab ownership figures are relevant to the credibility of the witness when they make the unlikely report that the cab was blue.[88] Another common objection is that the cab ownership figures are too remote to be relevant. The figures we need are of the accident rates of the two cab companies.[89] There is some truth in this too. Accident rate figures would provide a better base rate. But if they are unavailable, the cab ownership figures should be used. To disregard the cab ownership figures is, effectively, to assume that both companies have an equal number of accidents. And this is to assume that each blue cab is 5.67 times as likely to have an accident as each green cab. This seems a dangerous assumption if there is no evidence to support it.

Experiment 2: Direct Identification Evidence and Causal Base Rate Data

For this experiment the subjects were told that while the two cab companies were roughly equal in size, 85 per cent of the accidents involved green cabs, and 15 per cent involved blue cabs.[90] Again the subjects were told that a witness with 80 per cent reliability identified the cab as being blue. In this experiment the answers were highly variable, but the average response was that there was a 60 per cent probability that the cab was blue.

The only distinction between this experiment and the first is that the incidental base rate data was replaced by causal base rate data. The accident statistics are still base rate data in that they have equal application to each accident. However, they have a causal connection with the accident. Factors behind past accidents appearing in the statistics may also lie behind the present accident.

Interestingly, the average response lies about half way between the reliability of the witness (80 per cent) and the correct answer (41 per cent). This experiment, when considered in conjunction with Experiment One, reinforces the hypothesis that humans have a strong preference for direct evidence over base rate data. We may further hypothesise that they have a preference for causal base rate data[91] over incidental base rate data.

Experiment 3: Circumstantial Identification Evidence and Incidental Base Rate Data

In this experiment,[92] as in the first experiment, the subjects were told that 85 per cent of the town's cabs were green, and 15 per cent were blue. However, the direct identification evidence of the eyewitness was replaced by circumstantial

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87 For example, Cohen, L J, "Can Human Irrationality be Experimentally Demonstrated?" (1981) 4 *Beh'l & Brain Sci* 317 at 328–9.

88 Mackie, J L, "Propensity, Evidence and Diagnosis" (1981) 4 *Beh'l & Brain Sci* 345 at 346.

89 Above n87 at 329, 365; cf Brook, above n18 at 346; Callen, C, "Notes on a Grand Illusion: Some Limits on the Use of Bayesian Theory in Evidence Law" (1982) 57 *Ind LJ* 1 at 8 n33.

90 Above n86 at 157.

91 Id at 157–8.

92 This experiment, originally conducted by Bar-Hillel, was reported by Kahneman and Tversky; id at 158.

identification evidence. The subjects were told that mobile-phones had been installed in 80 per cent of green cabs and 20 per cent of blue cabs, and that the cab involved in the accident was equipped with a mobile-phone. This evidence is circumstantial in that, even if accepted, it does not conclusively establish the colour of the cab in the accident.

In this experiment, the subjects utilised the incidental base rate data to a considerable degree. The median answer was that there was a 48 per cent probability that the cab in the accident was blue, which is quite close to the correct answer of 41 per cent.

A comparison between this experiment and the first suggests the hypothesis that humans have a preference for direct identification evidence over circumstantial identification evidence.

Experiment 4: Incidental Base Rate Data

In a fourth experiment subjects were only given the cab ownership figures. Kahneman and Tversky found that in the absence of other kinds of evidence, almost all subjects utilized the incidental base rate data and arrived at the correct answer.[93] This is of particular interest because it suggests that in the Blue Bus case a fact-finder would accept that it is 80 per cent probable that the Blue Bus Co was responsible. However this is not the same thing as a fact-finder attributing responsibility for the accident to the Blue Bus Company. The subjects were not asked whether the defendant should be held liable, but were told that a witness had seen the accident, and were asked, "what is the probability that the witness identified the cab as blue?[94]

B. Interpretation of the Results: Evidence, Probability and Story-Telling

Psychologists suggest that "when estimating probabilities people can use several cognitive strategies based upon different types of information".[95] Two that have been identified are frequency-based judgments, and scenario-based judgments. Frequency-based judgments are, as the name suggests, "ideally suited for repetitive activities".[96] Scenario-based judgments, on the other hand, are made where the events "are perceived as so unique that past history does not seem relevant to the evaluation of their likelihood".[97] In most situations where people make probability judgments, frequency data will not be available.[98] Research indicates that people have a strong leaning towards scenario-based judgments, utilising frequency data only when scenario data is unavailable.[99]

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93 Id at 157.

94 Ibid.

95 Hendrickx, L, Vlek, C and Oppewal, H, "Relative Importance of Scenario Information and Frequency Information in the Judgment of Risk" (1989) 72 *Acta Psychologica* 41.

96 Id at 60.

97 Tversky, A and Kahneman, D, "Availability: A Heuristic for Judging Frequency and Probability" in Kahneman et al, above n85, 163 at 177.

98 Id at 176.

99 Hendrickx, Vlek and Oppewal report, as a result of their experiments, that "the validity of the frequentistic probability theory as a descriptive psychological theory or risk judgment is questionable": above n95 at 58.

According to Kahneman and Tversky, people "evaluate likelihood by attempting to construct stories, or scenarios. ... The plausibility of such scenarios, or the ease with which they come to mind, can provide a basis for the judgment of likelihood".[100] This method of probability assessment will be useful where the events in question are unique and frequency data is unavailable. Indeed it is difficult to imagine how else such probabilities could be assessed. But this method can lead to systematic biases. Slovic, Fischoff and Lichtenstein suggest that "scenarios which tell a 'good story' by burying weak links in masses of coherent detail may be accorded much more credibility than they deserve".[101] As a corollary, mathematically strong data may be considerably discounted if it offers little colour or detail to a scenario.

This account of human probability assessment offers an explanation for the experimental results described above. Obviously, the best story of the cab accident will be told by the eyewitness. The eyewitness was there at the time, and is in fact an actor in the story of the accident. They may be able to tell not only who was involved, but also when, where, how and why the accident occurred. Because of the detail that the witness is able to offer, the fact-finder gives this evidence considerable weight. By comparison, the cab ownership statistics in the first experiment add very little detail to the account of the accident. At best, they provide a clue as to who may have been involved, and say nothing about where, when or how the accident occurred.

The accident statistics of the two cab companies in the second experiment have more to say than the raw cab ownership data. In addition to telling who may have been involved, they tell why the accident occurred. They point to the poor driving ability of the green cab drivers as the possible cause of the accident. However, they still offer little detail in comparison with the evidence of the eyewitness.

The circumstantial identification evidence in the third experiment also adds some colour to the story of the accident. In addition to suggesting which company's cab was involved, this evidence may tell when or where the accident occurred. (If the evidence was in the form of remnants of a mobile-phone at the scene of the accident, it would at least tell where the accident occurred. If the evidence was in the form of a message transmitted from the accident-cab, it may indicate when the accident occurred.) Unlike the base rate data, the evidence is unique to this accident and so may be given greater weight by fact-finders.

While the fourth experiment suggests that people will employ a frequency method of judgment where scenario information is unavailable, the other experiments show a human preference for a scenario-based process of judgment.[102]

C. *Human Probability Judgments and the Civil Standard of Proof*

Most law trials will arise out of a unique series of events. One may view certain mass-tort cases, such as those arising out of the use of agent orange and

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100 Above n97 at 176; cf Kahneman, D and Tversky, A, "The Simulation Heuristic" in Kahneman et al, above n85, 201 at 204–7.

101 Slovic, P, Fischoff, B and Lichtenstein, S, "Cognitive Processes and Societal Risk Taking" in Carroll, J and Payne, J (eds), *Cognition and Social Behaviour* (1976) 172 at 178.

102 See above n95 at 58.

thalidomide, and more recently, passive-smoking suits, as examples of non-unique cases, and it is not a coincidence that statistical evidence is often the most useful evidence in these cases. But generally speaking, statistical evidence will be unavailable. When it is available, in view of the preference humans have for scenario-based judgments over frequency-based judgments, statistical data is likely to be considered less persuasive than scenario data.[103]

It is not surprising then that the parties do not appeal to the fact-finder's frequency-based judgment faculty. The parties instead seek to tell the fact-finder their story of what happened.[104] How do they make their story convincing? By giving detail.

> Details ... are the veritable lifeblood of persuasive stories ... [T]he details make the story vivid; they allow the fact-finder to visualize the actual events. Hence details provide specific evidence and make stories credible and persuasive.[105]

Recent work by the psychologists Pennington and Hastie is consistent with this account of juridical proof. In their attempt to "develop a scientific description of the mind of the juror as it is revealed in the decision making process", they have found that "a central cognitive process ... is story construction".[106]

We can now understand the tension between the mathematical formulation of the civil standard, and the more subjective "belief" formulation. In the hypotheticals, for example, a fact-finder, by making a frequency-based judgment, would be aware that the plaintiff's case was mathematically more probable than not. This follows directly from Experiment Four where the subjects were given only incidental base rate data and recognised its strength. But the fact-finder may prefer to make a scenario-based judgment and insist on being told a more detailed story.

This is what occured in the collision cases, before the High Court, where a number of the judges expressed dissatisfaction with the evidence before them. They demanded a scenario-based proof "special to the particular case under consideration".[107] A frequency-based proof, resting upon "general considerations as to the likelihood of negligent conduct occurring in the conditions which existed at the time and place of the collision"would not be sufficient.[108] It appeared to them "a mere mechanical comparison of probabilities [independent] of any belief in its reality",[109] a gamble,[110] a guess,[111] and "purely conjectural".[112]

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103 Saks and Kidd, above n85 at 148; cf above n3 at 1334, 1376.

104 Binder, D and Bergman, P, *Fact Investigation From Hypothesis to Proof* (1984) at 12; cf Jonakit, R N, "Stories, Forensic Science and Improved Verdicts" (1991) 13 *Cardozo LR* 343 at 346–7.

105 Binder and Bergman, above n104 at 290–1.

106 Pennington, N and Hastie, R, "A Cognitive Theory of Juror Decision Making: The Story Model" (1991) 13 *Cardozo LR* 519 at 520 (italics in original); cf Allen, above n8.

107 *Jones v Dunkel* (1959), above n11 at 305 per Kitto J.

108 Ibid.

109 *Briginshaw v Briginshaw*, above n15 at 361 per Dixon J.

110 Above n95 at 60.

111 *Jones v Dunkel*, above n11 at 305 per Dixon CJ; applied in *West v GIO*, above n11 at 440 per Stephen, Mason, Aicken and Wilson JJ.

112 *TNT v Brooks*, above n11 at 350 per Gibbs J, Stephen, Mason and Aicken JJ agreeing; cf *Jones v Dunkel*, above n11 at 305 per Kitto J.

D. Res Ipsa Loquitur: "The Thing Tells Its Own Story"[113]

This analysis raises the question of how the res ipsa loquitur line of reasoning gained acceptance. In these cases the evidence is so sparse that the plaintiff is unable to give evidence of the precise breach of duty which caused the accident. All the plaintiff is able to do is point to the fact of the injury and say, "the thing speaks for itself". Without a detailed story of the accident, why have the courts allowed plaintiffs to recover?

It is commonly said that the doctrine was developed for policy reasons: to make it easier for the plaintiff to establish his or her case where the evidence was in the defendant's domain;[114] or to extend the availability of compensation as a step towards strict liability.[115] No doubt both these policies played a role. Yet the doctrine can also be analysed through the account of forensic proof advanced above.

A traditional requirement for the application of the res ipsa loquitur doctrine was that "the thing [causing the plaintiff's injury] is shewn to be under the management of the defendant or his servants".[116] This requirement has a number of important implications. First, it means that the doctrine has application to stable environments that endure over time. In many cases, for example, a defendant occupier was held liable where something fell from his or her window onto the plaintiff passing by in the street,[117] or a defendant manufacturer whose defective product injured the plaintiff.[118] The story of the accident in a res ipsa loquitur case has a basic structure and the parties have defined roles: the defendant was in control of the thing causing injury; the plaintiff, innocent and vulnerable, was powerless to prevent the injury.

With this basic structure most res ipsa loquitur cases tend to tell familiar stories with a single missing item: was the defendant in breach of his or her duty? And because of the stability of the situation, the fact-finder is able to fill this gap in the story by calling on its own experience. More recently, experts have been allowed to give evidence about what ordinarily happens in matters outside the experience of the fact-finder.[119] The fact-finder can then ask itself whether in "the ordinary course of things" the plaintiff would suffer such an injury "if those who have the management use proper care".[120] The fact-finder is able to view the occasion of the accident as one of a series of accidents and non-accidents, and feels comfortable applying a frequency-based probability judgment to complete the story of the accident.

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113 *Ballard v North British Railway Co* (1923) SC (HL) 43 at 56 per Lord Shaw of Dunfermline.

114 Compare with Salmond, J and Heuston, R, *Salmond and Heuston on the Law of Torts* (18th edn, 1981) at 223; Fleming, J, *The Law of Torts* (5th edn, 1977) at 307–8; Prosser, W, "Res Ipsa Loquitur in California" in Prosser, W, *Selected Topics on the Law of Torts* (1953) 302 at 331, 360–5; Jaffe, L, "Res Ipsa Loquitur Vindicated" (1951) 1 *BULR* 1 at 6–7; Seavey, W, "Res Ipsa Loquitur; Tabula in Naufragio" (1950) 63 *Harv LR* 643 at 645, 647.

115 Compare with Fleming, id at 303; Prosser, id at 363–5.

116 *Scott v London and St Katherine Docks Co* (1865) 3 H&C 596 at 601; 159 ER 665 at 667 (Exch Ch) per Sir William Erle CJ.

117 *Byrne v Boadle* (1863) 2 H&C 722 at 725; 159 ER 299 at 300.

118 *Pillars v R J Reynolds Tobacco Co* 117 Miss 490 (1918) at 500 per Cook CJ.

119 Prosser, above n114 at 317–9, 342–4; Fleming, above n114 at 304–5.

120 Above n116.

In these respects res ipsa loquitur cases are in contrast with collision cases. The characters in the latter cases are less defined: either, neither or both of the parties may have caused the accident, and often both will have suffered injuries. Questions will be raised about the ability and capacity of the parties and the state of repair of their vehicles. Moreover questions will be raised about external factors: road and weather conditions, and other unknown drivers. The situation giving rise to the accident appears to be a unique one. A frequency-based judgment based on background evidence seems inappropriate. The fact-finder demands the detailed evidence that will support a scenario-based judgment.

In Australia res ipsa loquitur is no longer regarded as a doctrine, but merely as a "process of logic".[121] Accordingly, frequency-based probability judgments should readily be made in singular situations, such as collisions. But, as we have seen, some judges are reluctant to apply the res ipsa loquitur reasoning universally. In particular, as a number of commentators have noted, courts have shown reluctance in applying the doctrine to collision cases.[122] This analysis explains the divergence between theory and practice. In theory the courts recognise that res ipsa loquitur is merely a process of logic. And yet, in practice, res ipsa loquitur stubbornly retains the narrow operation of a distinct rule of law.

E. Cases with a Number of Questions of Fact: The Conjunction Problem

A number of commentators have suggested that the mathematical standard becomes incoherent in a case where the proof of a number of elements is in issue.[123] These commentators suggest that a mathematical interpretation of the civil standard would require the plaintiff to merely prove each element to a level of greater than 50 per cent (or 0.5). This however would allow the plaintiff to succeed even though the probability of all elements being present is less than 0.5. Allen gives an example of a tort action where "the probability of each of two independent elements ... breach and causation, is 0.6. [Then] the probability of their both being true is 0.6 x 0.6 = 0.36". According to Allen, the plaintiff would be entitled to succeed even though it is more probable than not that one element is absent.

The first thing to note about this criticism is that it does not apply to the collision cases and the hypothetical cases which raise only a single issue of fact. As far as multi-issue cases are concerned, a consideration of the actual process of proof reveals the conjunction problem to be something of an illusion. In practice the mathematical standard will require the plaintiff to construct a story, with probability level of greater than 50 per cent, which includes each of the required elements.

As Allen recognises,[124] where the elements of a case are not probabilistically independent, the simple conjunction rule does not apply: the proof of

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121 Above n23.

122 *Godfrey v Brown* P2d 165 (1934); Jaffe, above n114 at 5; cf Baker, D, *Introduction to Torts* (1985) at 10; Prosser, above n114 at 334–9.

123 Allen, above n8 at 374–5; above n19 at 95–6.

124 Allen, above n8 at 374 n4.

a particular element will entail to some degree the proof of other dependent elements. Often elements will be heavily dependent. This is particularly so in a negligence action where the duty, standard, causation and remoteness elements all revolve around the concept of reasonable foreseeability. Elements will also be heavily dependent where they hinge upon the credit of a witness.

The dependence of different elements becomes even greater when we consider how the fact-finder actually assesses the evidence. As Allen acknowledges, the fact-finder does not mathematically weigh up the evidence relating to each element. Rather the fact-finder forms a story on the basis of all the evidence and then assesses the coherence of the story.[125] The fact-finder is directed that each element should be proven to be more probable than not. But in practice this means no more than that the story should incorporate each requisite element. This paper endorses Allen's primary goal: to make evidence scholarship and the law more relevant and effective by relating them to the actual processes of the fact-finder. It is argued, however, that Allen is wrong to reject mathematical theory altogether. Admittedly, mathematical theory fails as a descriptive theory.[126] Nevertheless it retains normative relevance. Once the fact-finder has processed all of the evidence through the construction of a story and/or a frequency-based judgment, it should be directed to assess the likelihood of the plaintiff's case and accept it if it is found more probable than not. This standard is well founded in considerations of equality and accuracy. A probabilistically strong story should not be rejected merely because it lacks detail.

F. Is it Rational to be Wrong?

Jonathan Cohen has suggested that, however non-mathematical and inaccurate human reasoning is, it is by definition rational: "ordinary human reasoning ... cannot be held to be faultily programmed: it sets its own standards".[127] This argument, within limits, is difficult to refute. As Kyburg has observed, the "standards of rationality ... are human standards, and ... a standard that no human could approximate would clearly be inappropriate".[128] It is clear that human assessments of uncertainty and probability can be made rapidly and effectively in a diverse range of environments.[129] Mathematical methods, on the other hand, will often be slow and awkward, even if they are ultimately more accurate. It will not always be irrational to be non-mathematical. But why should we draw this line between human reasoning and mathematical theory? Mathematical probability theory is, after all, a human invention (or discovery), a tool which is available to improve human reasoning.[130] In certain situations one would expect a rational decision-maker to employ mathematical methods.[131] Where the decision is an important one, and the

125 Id at 396–406; Pennington and Hastie, above n106 at 527–9.
126 Id at 545; Allen, above n8 at 380.
127 Above n87 at 317.
128 Kyburg, H, "Intuition, competence and performance" (1981) 4 *Beh'l & Brain Sci* 341 at 342.
129 See Tillers, P, "Mapping Inferential Domains", in Tillers and Green, above n43, 299 at 313; Gardner, H, *The Mind's New Science* (1985) 376; Kahneman, D. and Tversky, A, "On the Study of Statistical Intuitions" in Kahneman et al, above n85, 493 at 501.
130 See Krantz, D, "Improvements in Human Reasoning and an Error in L J Cohen's" (1981) 4 *Beh'l & Brain Sci* 340 at 340–1.
131 See Blackburn, S, "Rational animal?" (1981) 4 *Beh'l & Brain Sci* 331 at 331–2.

mathematical methods are readily available, it would be irrational not to use them. That is unless there is some other goal, more important than accuracy, that would thereby be compromised. The mathematical standard is in line with an abundance of authority. It treats the parties equally and will lead to the greatest expected accuracy. What reason is there not to adopt it?

5. *Justice*

A. *The Appearance of Justice*

"Justice must satisfy the appearance of justice".[132] It has been suggested that a greater harm than inaccuracy would be caused if the courts were to adopt counter-intuitive mathematical standards of proof. Nesson stresses the importance of verdicts being acceptable to the community, so that legal rules are effectively projected.[133] In a similar tone, Tribe emphasises the importance of the "myth of certainty" for criminal trials, and warns of the broader danger of the "dehumanization of justice".[134] These policy goals are contradictory. This is perhaps most apparent in Ligertwood's adoption of Tribe's arguments: "[the] myth of certainty is important to the continued confidence in the present system of criminal trial". And immediately afterwards: "[i]t is also important that the public understand the process of proof".[135] It is anomalous, to say the least, to argue at the same time for the promotion of understanding and the projection of a myth.

It is difficult either to prove or rebut such broad claims about the interaction of society and the law,[136] but we can test their assumptions. And it is not surprising that these contradictory goals were derived from questionable assumptions. Are the public really so aware of how the courts operate as to be disturbed by counter-intuitive procedural rules?[137] Would the public really benefit more from the appearance of accuracy than the reality of accuracy?[138] There is the additional risk that the attempt to project the illusion of accuracy may fail, resulting in disillusionment and cynicism.[139]

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132 *Offut v US* 348 US 11 (1954) at 14 per Frankfurter J; cf Australian Law Reform Commission, Evidence Reference, Research Paper No 7: *Relevance* (1982) ALRC, Canberra at 48.

133 Nesson, C, "The Evidence or the Event? On Judicial Proof and the Acceptability of Verdicts" (1985) 98 *Harv LR* 1357.

134 Above n3 at 1373–7.

135 Above n14 at 387.

136 See Shaviro, D, "Statistical-Probability Evidence and the Appearance of Justice", (1989) 103 *Harv LR* 530 at 544.

137 Id at 548–51; Allen, R, "Rationality, Mythology, and the 'Acceptability of Verdicts' Thesis" (1986) 66 *BULR* 541 at 544–57.

138 Above n136 at 544–5; Allen, above n137 at 552–3; Cohen, N, "The Costs of Acceptability: Blue Buses, Agent Orange, and Aversion to Statistical Evidence"(1986) 66 *BULR* 563 at 568–570.

139 Above n136 at 544–5; cf Williams, G, "The Mathematics of Proof" [1979] *Crim LR* 297 at 306; Saks and Kidd, above n85 at 156.

B. Focusing on the Individual

A rational fact-finder might be diverted from the goal of accuracy by other considerations of justice. In the criminal trial, there are a number of rules, such as the privilege against self-incrimination, which reveal a concern for the sanctity of the individual, rather than accuracy. It has been suggested that similar considerations explain why the plaintiffs would fail in the hypotheticals.

Williams, for example, while endorsing the "more probable than not" standard, refers to a distinct rule of law relating to proof, that requires that the "evidence should focus on the defendant".[140] In the Gatecrasher case the attendance figures say something about the class of 1 000 people that attended the rodeo; that there is a 50.1 per cent probability that each of them gatecrashed. They say nothing about the defendant in particular.

But the focus rule fails to explain a finding for the defendant in the Blue Bus case. In the first place, one might question whether a rule based upon respect for the individual has any application to companies. Assuming it does, the bus-ownership figures would appear to satisfy it. This evidence focuses on the Blue Bus Co as the single largest operator in the town. While the evidence is statistical, it describes a feature that is possessed by the defendant alone. Williams recognised that the focus rule did not apply to the Blue Bus case. However he still considered that the plaintiff would fail, advancing another ad hoc explanation. "The reason lies in the unacceptability of holding that a person is liable ... merely because he [sic] is the largest operator in the field".[141] This merely begs the question.

A graver weakness with the focus argument is that many common types of evidence do not focus on the individual. Consider, for example, where a witness in the Gatecrasher trial points to the defendant and says "that is the person I saw climbing over the fence". Saks and Kidd suggest that, even with this most direct form of evidence, "we are dealing with classes containing more than one person".[142] No further explanation is offered. Who might the other people in the class be? In a sense, the question is a subjective one. If the fact-finder considered the eyewitness in the Gatecrasher trial to be 80 per cent reliable, they might visualize a notional class of 10 identifications in which eight were correct. Looked at this way, the defendant is merely one in a class of 10 identifications, eight of which are correct. Another fact-finder may have doubts about the witness's reliability and consider that the evidence focuses not on the defendant, but on the class of people attending the Rodeo that resembled the gatecrasher.

One might have doubts about these interpretations of direct evidence, but there can be little doubt that most circumstantial evidence operates by placing the individual in a class, and saying something about that class. The individual may be the only person to whom the characteristics of the class are attributable at the relevant time, but nevertheless, they are class characteristics.

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140 Williams, above n139 at 305; cf Dworkin, R, "Morality and the Law" (May 22, 1969) *The New York Review of Books* 29 at 33.

141 Williams, G, "A Short Rejoinder" [1980] *Crim LR* 103 at 106.

142 Saks and Kidd, above n85 at 154; cf above n3 at 1330.

This point can be illustrated by considering the South Australian case of *State Government Insurance Commission v Laube*.[143] The case arose out of a collision between Laube's car and a pedestrian. Laube admitted liability for the accident and the injured pedestrian obtained compensation from Laube's insurance company. The insurance company later brought this action seeking reimbursement from Laube. They claimed that Laube was in breach of his insurance policy by driving while "so much under the influence of intoxicating liquor ... as to be incapable of exercising effective control of the vehicle".[144] There was evidence that Laube had the blood alcohol level of 0.15 per cent at the time of the accident, three times the legal limit. However, there was no other evidence of Laube's capacity for driving at the time of the accident. The insurance company relied on the testimony of a medical expert who said that "a level of the order of .15 implies that a particular person is most unlikely not to be impaired to a significant degree by the effects of the alcohol".[145] However, the insurance company failed both in the District Court and in the South Australian Supreme Court.

King CJ referred with approval to the view of Williams that the evidence must "focus on the defendant",[146] and said:

> I am clearly of the opinion that the statistical fact that a particular proposition is true of the majority of persons cannot of itself amount to legal proof on the balance of probabilities that the proposition is true of any given individual. The fact that most people with a blood alcohol level of 0.15 per cent are incapable of exercising effective control of a motor vehicle does not establish ... that that individual is so incapable.[147]

Clearly, if a feature is possessed by the statistical majority, without evidence to the contrary, it is more likely than not that it will be possessed by a given individual. King CJ rejected a purely mathematical standard of proof, adopting Williams' additional requirement, that the evidence "focus on the defendant".

Yet one wonders what King CJ would be satisfied with, short of direct evidence. He observed that the witness's evidence concerning the defendant's capacity for driving was based upon observations, not of the defendant, but of other persons. However, the same can be said of virtually all assessments based on circumstantial evidence. Evidence of motive, for example, is generally considered highly relevant in a murder trial, but how is it relevant? It is circumstantial evidence. We know from experience that the class of people with a motive to kill are more likely kill than the class of people without a motive. Evidence of motive puts the accused in a narrower class with a higher likelihood of guilt. The reasoning process hinges upon observations of people other than the accused.

It is possible to distinguish the Gatecrasher case from *SGIC v Laube*, and perhaps confine the operation of Williams' focus rule. In the Gatecrasher case, there was a presently existing class of 1 000, whereas in *SGIC v Laube*, the

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143 Above n15.
144 Id at 37.
145 Id at 38.
146 Compare with Eggleston, R, "Focusing on the Defendant" (1987) 61 *ALJ* 58.
147 Above n15 at 33. Millhouse and Prior JJ agreed in separate judgments without referring to Williams' view.

class was built up over time and only one person from that class was involved in the accident. Williams himself would not have applied the focus rule to *SGIC v Laube* because of this. He suggests that in a criminal trial, evidence of the accused's flight may be considered to make it 80 per cent probable that the accused is guilty, because "80 in 100 of those who flee are guilty".[148] This evidence, according to Williams, does focus on the accused because they were the only one to flee from the crime under investigation.[149] But this distinction appears rather technical when one is invoking considerations of justice. Clearly this distinction did not strike King CJ.

King CJ did not appear aware of the potential breadth of operation of the focus rule. Why was its application so appealing to him in that case? The explanation can be found in the form in which the evidence was presented. The expert witness "made the point ... several times of refusing to link what he was saying specifically to any individual, certainly not to the defendant".[150] It is unclear whether this was due to scientific rigour on the part of the expert witness, or was a result of the rule of evidence that an expert may not answer the ultimate question of fact.[151] But why should the form of the evidence be important? The substance of the witness's evidence was that it was "most unlikely" that the defendant's control of the vehicle would not be "impaired to a significant degree by the effects of alcohol".[152]

SGIC v Laube demonstrates the potential breadth of the focus rule. Applied consistently a plaintiff would rarely succeed without direct evidence. There is no apparent rationale for placing such a massive obstacle in the path of plaintiffs and experience indicates that the rule is not applied consistently; plaintiffs do succeed without direct evidence. Yet attempts to express the rule more narrowly appear unduly technical and formal. However one looks at the focus rule, its operation appears arbitrary and unsupported by considerations of justice.

The argument that the evidence should single out the defendant as an individual has been presented in a slightly different form. The suggestion has been made by Dant that by adopting the mathematical standard, fact-finders are merely "minimizing long-run error" and are not attempting to find "the correct verdict for the particular case".[153]

The focus argument is weaker still in this form in invoking considerations of accuracy and rationality rather than vague notions of justice. To minimise "long run error", is to minimise the number of "particular cases" decided incorrectly, and at the same time it will minimise the probability that a "particular case" will be decided incorrectly. Contrary to Dant's assertions, statistical

148 Williams, above n139 at 347.
149 Above n141 at 106.
150 Above n143 at 36 per Millhouse J.
151 The extent of this rule's operation is uncertain, particularly where the ultimate question is one that only a medical expert can answer; cf *R v Davies* [1962] 3 All ER 97.
152 Above n145.
153 Dant, M, "Gambling on the Truth: The Use Of Purely Statistical Evidence As A Basis For Civil Liability" (1988) 22 *Colum J L & Soc Prob* 31 at 49; cf above n6 at 120; Bergmann, P and Moore, A, "Mistrial by Likelihood Ratio: Bayesian Analysis Meets the F-word" (1991) 13 *Cardozo LR* 589 at 91–2.

proof provides an eminently "rational basis for drawing specific conclusions as to particular events".[154]

C. *Characters in a Story*

The arguments based upon the need to focus on the defendant have an intuitive appeal, but on closer inspection have not been convincing. They can be understood as another manifestation of the persuasiveness of a detailed story. One of the most important features of any story is clearly defined characters. The evidence in the Gatecrasher case pointed not to the defendant, but to a cast of 1 000. The evidence in the Blue Bus case, while focussing on the defendant, the Blue Bus Co, did not focus on an individual bus. With one of the central players out of focus, the story is colourless and much less persuasive.

D. *Statistical Judgments and Intuitive Judgments*

We have seen in the preceding discussion that, from the point of view of justice, proof on the basis of statistical evidence, as in the hypotheticals, has the same basic structure as ordinary forensic proof. There are however differences of degree between statistical proof and the more intuitive clinical or diagnostic proof that is the norm. In either case, as each characteristic of the defendant is considered, the defendant is in effect being classified in different ways. The final judgment is made on the basis of class characteristics. In the case of diagnostic judgment, however, an "intuitive judgment [is made] about the relation of many factors, whereas the [statistical proof] is limited by [its] methodology to considering but a few".[155] A diagnostic judgment will therefore appear more individualised. While each factor invokes class characteristics, the combination of factors in the specific case may be unique. And since the process of assessing the evidence takes place intuitively and internally, the decision-maker becomes more involved in the particular assessment and is more likely to construct a mental picture of what occurred. These factors lead the decision-maker to a greater acceptance of the story told by the evidence.

These considerations suggest an explanation for the result in *SGIC v Laube*.[156] The insurance company was calling upon the court to make a statistical judgment. There was only one piece of evidence pointing to the defendant's incapacity, the high blood alcohol reading, and the significance of the evidence was explained in statistical terms by an expert witness. The court was not required to draw on their own experience to assess the strength of the evidence. As a result, the court did not become as involved in the assessment of the evidence, and did not construct a story explaining the cause of the collision. The expert witness refused "to link what he was saying specifically ... to the defendant" and the court, with no story of what had occurred, would not take this final step either.[157] It was held that the evidence, mathematically very strong, did not satisfy the standard of proof.

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154 Dant, id at 45.

155 Nesson, C, "Agent Orange Meets the Blue Bus: Fact-finding at the Frontier of Knowledge" (1986) 66 *BULR* 521 at 534.

156 Above n15.

157 Compare with *R v Abadom* [1983] 1 WLR 126.

E. Individual Autonomy

A further argument calls on the court to respect the freedom and autonomy of the individual. Stoebuck declares "the accused is not a statistic".[158] Probability theory, he claims, "operates only when the events sampled are random", such as the throwing of a dice, and does not apply to acts arising "from complex subjective human motives".[159] Stoebuck is technically incorrect; probability theory does apply to "non-random" human actions such as gatecrashing and negligent driving. However Stoebuck's real concern appears to be that probability theory should not be applied to voluntary human actions. McCormick expresses this concern more clearly:

> [W]here the statistical indicators pertain to volitional conduct, the courts are cautious because they place great weight on a conception of human autonomy and dignity that the coldly statistical analysis would undermine. To put it another way, shying away from the statistical predictions reflects a belief that everyone should have the opportunity to depart from the statistical norm.[160]

For example, in the Gatecrasher case, it could be argued that basing a verdict on the attendance figures denies the defendant's capacity to choose not to gatecrash, to be part of the smaller group rather than the larger group. Eyewitness evidence that the defendant climbed over the fence is preferable. It respects the defendant's autonomy because it is evidence that the defendant chose to gatecrash.

But is the law of evidence really concerned with such niceties?[161] Consider again evidence of motive. Suppose that a witness testifies at the Gatecrasher trial that the defendant on the day preceding the rodeo had said that he or she wanted to go to the rodeo but could not afford it. A fact-finder would have no moral misgivings about using the plaintiff's evidence. The fact-finder would use the evidence by applying a causal law to the defendant: because the defendant had a motive to gatecrash, (it becomes more likely that) the defendant did gatecrash. Surely this would present an even greater threat to the defendant's autonomy. When it is said that a human being is free, "that means according to the usual view, that he [sic] is not subjected to causal laws determining his behaviour".[162] And yet evidence of motive is considered uncontroversial, even in criminal trials.

F. The Individual and the Civil Trial

It appears from the preceding discussion that the law of evidence does not place a priority on the respect for the individual. In order to make an accurate assessment of the facts, it is necessary to classify individuals, and to apply causal laws to their behaviour. Of course, the criminal law places certain limits on the

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158 Stoebuck, W, "Relevancy and the Theory of Probability" (1966) 51 *Iowa LR* 849 at 858.

159 Ibid.

160 Above n16 at 651 n3; cf Underwood, B, "Law and the Crystal Ball: Predicting Behaviour with Statistical Inference and Individualized Judgment" (1979) 88 *Yale LJ* 1408 at 1414–20; Wasserman, D T, "The Morality of Statistical Proof and the Risk of Mistaken Liability" (1991) 13 *Cardozo LR* 935 at 40.

161 See La Rue, L H, "Stories Versus Theories at the Cardozo Evidence Conference: It's Just Another Metaphor To Me" (1991) 13 *Cardozo LR* 121 at 137.

162 Kelsen, H, *What is Justice*? (1957) at 334.

use of evidence out of a concern for the accused's individual autonomy. However, the criminal law is based upon the notion of individual autonomy: "only because man is free can he [sic] be made responsible for certain acts".[163] Intention is an element of most crimes. The criminal law punishes the accused for choosing to commit the crime. The civil law, on the other hand, is concerned not with autonomy and responsibility, but with dispute resolution and compensation.[164] As Oliver Wendell Holmes has commented:

> [A] man is answerable for all the consequences of his [sic] acts ... he acts at his peril always, and wholly irrespective of the state of his consciousness upon the matter. ... [W]hen men live in society, a certain average of conduct, a sacrifice of individual peculiarities going beyond a certain point, is necessary to the general welfare.[165]

6. *Conclusion*

The arguments above have invoked considerations of justice — the importance of respecting the autonomy of the individual. However, a prime concern of justice, and one of great importance to the parties involved in the trial, is accuracy. What could be a greater injustice than one party evading a financial loss at the other party's expense? Adopting the mathematical "more probable than not" standard minimises the injustice of wrong decisions.

Another consideration of justice in civil trials is treating the parties equally. While defendants may appreciate the respect being shown for their individuality, particularly if it allows them to evade liability, how would they feel if they were plaintiffs who were wrongly being denied compensation? In many cases it will be fortuitous whether a party to a civil action ends up as plaintiff or defendant. It is necessary to place the onus of proof somewhere, and the law places it on the plaintiff, perhaps to discourage frivolous actions. Yet it would be arbitrary to give the placement of the onus of proof any greater significance than is necessary. The onus of proof in ordinary civil cases should be used only to decide the result where the evidence is equally balanced. Why should it be made harder for plaintiffs to establish their version of facts than it is for defendants to establish theirs? Why should the defendant be favoured?

The commentators protesting against the mathematical standard of proof seem to think that the defendant in an ordinary case has more to lose than the plaintiff. They express concern that accepting the statistics in the Blue Bus case will mean that the Blue Bus Co will bear the liability for all accidents involving unidentified buses.[166] They suggest that the fact-finder should have the option of making "no decision" if it finds the evidence unpalatable.[167] They worry about the defendants losing their fortunes.[168] But should all the plaintiffs be denied compensation when hit by unidentified buses?[169] These

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163 Ibid; cf Hart, H L A, *Punishment and Responsibility* (1968).
164 Holmes, O W, *The Common Law* (1963) at 64.
165 Id at 65 and 86.
166 Above n3 at 1349–50.
167 Callen, above n89 at 19; above n9 at 142; above n73 at 90; above n43 at 157.
168 Dant, above n150 at 50; above n19 at 98.
169 Brook, above n54 at 102; above n54 at 73; cf Eggleston (1983), above n10 at 41.

commentators seem unaware that a decision to make "no decision" is a decision for the defendant,[170] and that the plaintiff's fortune is just as much at risk in a civil trial as the defendant's.[171]

While the policy grounds favouring the "more probable than not" standard are strong and clear, the arguments against it are vague and insubstantial. They do not withstand a close analysis. Yet we can understand why people are, on occasions, uncomfortable with the mathematical standard, and attempt to justify their intuitions. Where there are few pieces of evidence and they are remote from the critical events, the fact-finder is unable to form a picture of what occurred. Though the plaintiff's version of facts may be more probable than not, the fact-finder lacks belief in the plaintiff's story. While this position is understandable, it is unjust and irrational. The law should set a higher standard.

170 Brook, above n54 at 94; Kaye, D, "A First Look At 'Second-Order Evidence'" in Tillers and Green, above n43, 177 at 178; above n136 at 539.

171 Williams, above n139 at 303; above n18 at 340.