NOTES / AANTEKENINGE

STANDARDS OF PROOF: AID OR PITFALL?

1 Introduction

During the course of legal proceedings, evidentiary material is analyzed and evaluated in order to make a final judgement whether the responsible party has discharged the onus of proof. The existence of a standard of proof against which the presiding officer can measure the evidence submitted consequently plays a pivotal role. This standard of proof (*bewysmaatstaf*) represents the standard of guilt in legal science and has also been described as a standard of conviction. The standard of proof does not pertain to the inherent qualities of evidentiary material, but rather to the degrees of conviction of the presiding officer in a particular case. The function of the standard of proof is furthermore to provide presiding officers with a guideline/yardstick to measure the degree of conviction that the general public believe the presiding officer should have over the correctness of all the factual conclusions in the particular proceedings. In this article, the standard of proof in law will be discussed from a comparative point of view; different standards of proof from different jurisdictions will be considered and juxtaposed against similar standards used in the natural sciences.

Both science and the law require the weighing up of different and sometimes directly opposing hypotheses or evidence and – based on the outcome of this consideration – to make a probabilistic finding and draw inferences in favour of a particular conclusion or judgment. In science, this process of weighing up evidence and drawing inferences to support a particular conclusion is guided by quantitative criteria like statistical analysis (Loevinger "Standards of proof in Science and Law" Spring 1992 32 *Jurimetrics Journal* 323-344 323).

In law, on the other hand, the process of analyzing and assessing the weight of probative material is guided by "abstract notions of justice and fairness ..." (Morton and Hutchison *Presumption of Innocence* (1987) 11; and Schwikkard and Van der Merwe *Principles of Evidence* 3ed (2009) 558), namely the burden of proof and the standard of proof (these two concepts, the burden of proof and the standard of proof are often confused with each other and the terms are used interchangeably, as in McCauliff "Burdens of Proof: Degrees of Belief, Quanta of Evidence, or Constitutional Guarantees?" 1982 35 *Vanderbilt LR* 1293-1335). Analytically, however, both these processes rely on subjective assumptions or judgments (Loevinger Spring 1992 32 *Jurimetrics Journal* 323).

Generally, the concept of proof in law is said to be weaker than the concept of proof in natural sciences, since science (owing to the nature of the questions natural science deals with) has an empirical or pragmatic model of

validation that most other disciplines lack (Gordon and Walton *Proof, Burdens and Standards* http://www.dougwalton.ca/papers%20in%20pdf/09PrfStands.pdf (accessed 2010-06-11); and Loevinger Spring 1992 32 *Jurimetrics Journal* 323). Legal reasoning, on the other hand, is described as a "modelling process of shaping and understanding of facts, based on evidence, and an interpretation of the legal sources to construct a theory for some legal conclusion" (Gordon and Walton, above). And, the concept of proof in law is described as "a structure that demonstrates to a particular audience that a proposition satisfies its applicable proof standard ...", that is, the standards of proof (Gordon and Walton, above). In the process of the evaluation of evidence, various legal principles and rules govern the determination of the quantum and quality of probative material. Some of these concepts must first be defined before the discussion on the standards of proof can ensue.

The burden of proof refers to the obligation imposed on a particular party, in terms of a rule of law, to prove a particular fact in issue (Keane *The Modern Law of Evidence* 7ed (2008) 78-79; and for a comprehensive discussion on the burden of proof in South African law and English law see Dlamini "The Burden of Proof: Its Role and Meaning" 2003 1 *Stell LR* 68-88). The party bearing such a burden will lose on that issue if the party fails to discharge the burden of proof. It is furthermore only at the end of the trial, when both parties have presented all their evidence, that the presiding officer can draw a conclusion whether the particular party has discharged the burden and proved the particular fact in issue (Keane 79). The burden of proof must furthermore be distinguished from the evidentiary burden, another informative principle used to guide the process of the evaluation of evidence. The evidentiary burden refers to a "party's duty to produce sufficient evidence for a judge to call on the other party to answer" (Heydon and Ockelton *Evidence: Cases & Materials* (1996) 15; and Schwikkard and Van der Merwe 559). The evidentiary burden will be discharged if the particular party established a *prima facie* case against the accused. (*Prima facie* proof or a *prima facie* case implies that proof to the contrary is still possible, but in absence of such proof to the contrary, the *prima facie* proof will be regarded as conclusive proof.) Once a *prima facie* case is established, the evidentiary burden will shift to the opposing party (Schwikkard and Van der Merwe 550-560).

In this process of analyzing and assessing the weight of probative material and making a decision whether a party has discharged the burden of proof, a standard is consequently required against which the presiding officer can gauge or measure the case presented. The standard of proof, as a legal standard of guilt, has been described as a legal threshold of belief (G:\Standards of proof artikel\Probability, belief, and proof.mht (accessed 2010-06-11)). It does not refer to the intrinsic quality of the evidence, but rather to the degrees of belief in the mind of the decision maker; in other words "the subjective conviction of certainty in the mind of the trier of fact" (McCauliff 1982 35 *Vanderbilt LR* 1293). The function of a standard of proof is to "instruct the factfinder concerning the degree of confidence our society thinks he [or she] should have in the correctness of factual conclusions for a particular type of adjudication" (*Addington v Texas* 441 US 418 (1979) 423).

This article is not concerned with the process whereby probative material is analyzed, assessed and weighed, nor is the primary concern the burden of

proof. While reference will be made to these legal processes and principles, this article will rather focus on the *standards of proof* that have crystallized from case law and literature: proof on a balance of probabilities, clear and convincing proof, proof beyond a reasonable doubt, proof to a moral certainty, absolute proof and the civil law standard of intime conviction. These standards of proof will be juxtaposed against the scientific method of factfinding and reasoning, which is largely based on statistical calculations of frequency. In section two of this article the development of the standards of proof in law and science will briefly be sketched. Section three will provide an evaluation on the standards of proof in law and section four will focus on the application of these standards of proof as cognitive processes in legal matters. It will be argued in this article that mathematical calculations and probability theories cannot form the foundation of the legal reasoning process, as legal reasoning is a distinctive cognitive process whereby probative material is analyzed and assessed; a cognitive process that generates a level of confidence against which the factfinder can apply the relevant standard of proof (Clermont "Standards of Proof Revisited" 2009 33 *Vermont LR* 469-487 470).

2 The development of standards of proof in law and science

The development of standards of proof to ascertain facts spans centuries. Aristotle, in the third century BC, was the founder of formal logic with his theory of syllogisms and laws of thought in *Organon*. This Aristotelian view – that the truth can be established by logical and deductive reasoning – prevailed for more than a millenium. In 1620 Francis Bacon, an English barrister, published his *Novum Organum,* arguing that science involves two separate mental processes; the making of a discovery and the demonstration of its truth. Bacon's reliance on empirical observation is still today the fundamental premise of natural science (Loevinger Spring 1992 32 *Jurimetrics Journal* 324).

In a posthumous paper (1763) by Thomas Bayes a theorem was published that have had continued appeal with scientists and jurists alike and, although not explicitly recognized as such, is actually the kind of reasoning that is often used in both science and the law. This theorem suggests that information that is particularly unexpected or surprising, unless some hypothesis is assumed true, supports that hypothesis with great force when found (Loevinger Spring 1992 32 *Jurimetrics Journal* 325). (This model, the Bayesian model of evidence processing, has been the topic of many academic articles, *eg*, Kaplan "Decision Theory and the Factfinding Process" 1968 20(6) *Stanford LR* 1065-1092; Clermont 2009 33 *Vermont LR* 469-487; and Friedman "'E' is for Eclectic: Multiple Perspectives on Evidence" 2001 87 *Vancouver LR* 2029 and 2045-2046).

The philosopher, John Stuart Mill (*A System of Logic* (1843)) suggested that the principal method of reasoning in science, as well as in law, is a method of induction that involves generalizations or the stating of general principles based on a limited number of individual observations or facts. Mills purported that deduction always depends on induction as a first step to

establish the premises on which deduction is based. The second stage is ratiocination, the third verification, and the last stage involves both observation and deduction (Loevinger Spring 1992 32 *Jurimetrics Journal* 325).

While the basic principles of reasoning and logic are similar in science and in law and, based on the short historical exposition above, have the same origins, the functions of these two disciplines and the propositions to be established are quite different. The propositions in science are usually predictive in nature whilst the propositions in law are usually post-dictive. Science furthermore has at aim to construct a system of descriptive, general theories based on particular data, while the law consists of a system of normative, general rules that are individualized to apply to particular cases. The most obvious difference between science and law lies in the collection of extensive normative legal rules and principles governing the proof of facts *versus* the relatively few constraints on validating scientific proof. The constraints on scientific proof are imposed by physical reality and are referred to as scientific standards of validity. An example of such a constraint is the principle applied in astronomy and cosmology that large distances may only be measured to accuracy no greater than 30% (Loevinger Spring 1992 32 *Jurimetrics Journal* 328-331). And, in the realm of the microcosmos, the accuracy of all measurements is limited by the Heisenberg Uncertainty Principle. (According to the Heisenberg Uncertainty Principle it is basically impossible to fix the coordinates of a particle or to determine a physical event with higher accuracy than is given by Planck's quantum constant – In the *Concise Encyclopaedia of Science and Technology* 2ed (1989); and Loevinger Spring 1992 32 *Jurimetrics Journal* 331.)

Another differentiation between law and science lies in the standards of proof utilized to measure acceptable proof. Scientific standards of proof are expressed numerically, in terms of degrees of probability, while legal standards of proof are expressed in words and in terms of degrees of belief. In the following section the standards of proof utilized in the legal discipline will be evaluated.

3 Standards of proof

Something that even first-year law students will be able to recite by heart is that there are two standards of proof: The standard of proof for criminal cases is beyond a reasonable doubt, and for civil cases the standard of proof is on a balance of probabilities (Mirfield "How Many Standards of Proof are There?" January 2009 125 *Law Quarterly Review* 31-38 31). However, many jurisdictions in the USA have also recognized a third, intermediate standard of proof, namely clear and convincing proof. This intermediate standard, also referred to as clear, cogent and convincing proof, is usually applied in civil cases where the ordinary civil standard of proof seems, for some policy reason, to be unsatisfactory (Mirfield January 2009 125 *Law Quarterly Review* 32; McBaine "Burden of Proof: Degrees of Belief" 1944 32(3) *California LR* 242-268 245; and Clermont 2009 33 *Vermont LR* 469-487).

Although most common law jurisdictions do not follow their American counterparts in recognizing such an intermediate standard of proof, courts

have, in certain instances, applied the higher criminal standard of proof in non-criminal matters; justifying the deviation by arguing that the law simply reflects a policy choice of the higher standard as the correct standard in the particular matter (Mirfield January 2009 125 *Law Quarterly Review* 31; *eg*, *In re v Bramblevale Ltd* [1970] Ch 128 CA; *In re: Chinamasa* 2001 2 SA 902 (ZA) 925B-D; *Uncedo Taxi Service Association v Maninjwa* 1998 3 SA 417 (E) – civil contempt of court (the matter was left open in *Food and Allied Workers' Union v Scandia Delicatessen* 2001 3 SA 613 (SCA) par 40; see Van Rooyen "The Standard of Proof in Civil Contempt Cases" 2003 19 *South African Journal of Human Rights* 124-129; and *Percy v DPP* [1995] 1 W.L.R. 1382 DC – binding over; and *R (on the application of McCann) v Manchester Crown Court* [2002] UKHL 39; [2003] 1 AC 787 – anti-social behaviour orders). Another school of thought focuses on the flexibility of the two well-known standards of proof, proof beyond a reasonable doubt and proof on a balance of probabilities. In terms of thìs notion, the flexibility of a particular standard of proof is recognized as *degrees of proof* within a particular *standard of proof* (Mirfield January 2009 125 *Law Quarterly Review* 32). Cornhill CJ described the standards of proof as "flexible standard(s) to be applied with greater or lesser strictness according to the seriousness of what has to be proved and the implications of proving those matters ..." (*B v Avon and Somerset Constabulary* [2001] 1 WLR 340 DC [30]; and Mirfield January 2009 125 *Law Quarterly Review* 33).

In accordance with this line of thought, Denning LJ in *Bater v Bater* ([1951] P 35 CA 36-37) held that the degree of proof, in a particular standard of proof and in a particular case, depends on the gravity of the subject matter and not only the trite distinction made between the standard of proof in criminal and civil matters. And in yet another case, *Hornal v Neuberger Products Ltd* ([1957] 1 QB 237 CA 266) Morris LJ held that "the very elements of gravity become a part of the whole range of circumstances which have to be weighed in the scale deciding as to the balance of probabilities" (Mirfield January 2009 125 *Law Quarterly Review* 32). But, do these pronunciations on the flexibility of the standards of proof mean that we can accept as a rule of thumb that the more grave the matter the less the likelihood or probability of its eventuation? Because, although "the serious-ness of an allegation (may be) a function of the seriousness of its consequences, and *vice versa* ... there will (always) be cases where proof of an allegation will have serious consequences though it cannot be said that the matter alleged is inherently improbable" (*R (on the application of N) v Mental Health Review Tribunal (Northern Region)* [2005] EWCA Civ 1605; [2006] QB 468 [64]; and Mirfield January 2009 125 *Law Quarterly Review* 32). For example, the rape of a baby is a horrendous and grave act, but especially in South Africa, this crime is not that highly improbable and many successful convictions of this crime have come to pass in recent years.

And more inconceivable than the notion that there is an indirect correlation between the probability of a matter and graveness of the matter is the dictum that the standards of proof are flexible and may vary with the gravity of the misconduct alleged or the seriousness of the consequences for the person concerned (*Re B (Children) (Care Proceedings: Standard of Proof)* [2008] UKHL 35; [2008] 3 WLR 1 and Re D [2008] UKHL 33; [2008] 1 WLR1499 [5]; and Mirfield January 2009 125 *Law Quarterly Review* 35). It is submitted in

this article that such an utterly subjective approach to the analysis and evaluation of probative material cannot be accepted. The argument that the more serious the allegation or the more serious the consequences if the allegation is proved, the stronger the evidence before a court must be in order for that court to find that the allegation was proved on a balance of probabilities or beyond a reasonable doubt, is implausible with the notions of fairness and justice. (Richards LJ in *R (on the application of N) v Mental Health Review Tribunal (Northern Region) supra* 368 [62] held that the standards of proof are flexible in their application "the more serious the allegation or the more serious the consequences if the allegation is proved, the stronger must be the evidence before a court will find the allegation proved on the balance of probabilities". It was furthermore argued that the "flexibility of the standard lies not in any adjustment to the degree of probability required for an allegation to be proved, but in the strength or quality of the evidence that will in practice be required for an allegation to be proved on a balance of probabilities". Also see Schwikkard and Van der Merwe 581, where it is also incorrectly suggested that "more might be required to overcome the inherent improbability that certain conduct (*eg* fraud, or other immoral conduct) has occurred"; and Mirfield January 2009 125 *Law Quarterly Review* 37.)) The right to a fair trial and specifically the right to be presumed innocent until proved guilty requires that all accused persons be tried fairly, by known and unwavering standards and without the potential prejudice flexible subjective standards of proof may cause (s 35(3)(h) of the Constitution of the Republic of South Africa, 1996). Similarly, victims of crime and society in general are also entitled to justice in terms of the principle of legality and for perpetrators to be judged in terms of resolute standards known to all.

The proliferation of new standards of proof will furthermore only lead to confusion with the decision-makers who must apply them (McCauliff 1982 35 *Vanderbilt LR* 1295). It will allow for differing, individual standards of belief to be applied. That this should not be confused with the differing estimates of what the probabilities in a particular matter are, will be discussed in section four of this article. What is rather needed in each and every case, whether it is a civil or a criminal matter and whether or not the matter is regarded as serious or grave, is that the presiding officer(s) "devote the necessary critical attention to the evidence adduced in support of (the seriousness of the) charge" (*Re D* [2008] UKHL 33; [2008] 1 WLR 1499; and Mirfield January 2009 125 *Law Quarterly Review* 35). In South African law the standard of proof is not affected by the seriousness or graveness of the matter and is said to remain static throughout the proceedings (*S v Sinkanka* 1963 2 SA 531 (A); *S v Toubie* 2004 1 SACR 530 (W) 543b; and Schwikkard and Van der Merwe 570). The notion of flexible standards of proof has also been rejected in South African law (Schwikkard and Van der Merwe 580). The standards of proof/degrees of proof as these have crystallized from case law and literature will now be evaluated in the subsections to follow. (For a comprehensive discussion on standards of proof and the onus of proof in civil and criminal matters also see Zeffert and Paizes *The South African Law of Evidence* 2ed (2009) Chapters 3 and 4.)

3 1 Proof on a balance of probabilities/preponderance of evidence

Proof on a balance of probabilities is the lowest threshold of the five standards of proof. This standard is usually applied in civil proceedings and requires of the claimant to "outproof" the defendant by proving that the relevant fact is more probable than not. This standard is usually defined as "more probable than not" In other words, the quantum of evidence that is more probable than not is accepted as the truth (McCauliff 1982 35 *Vanderbilt LR* 1303; Loevinger Spring 1992 32 *Jurimetrics Journal* 334; G:\Standards of proof artikel\Probability, belief, and proof.mht (accessed 2010-06-11); and Zeffert and Paizes 54-57).

3 2 Clear and convincing proof

Clear and convincing proof is an intermediate standard of proof applied in civil cases where the ordinary civil standard of proof seems, for some policy reason, to be unsatisfactory. This standard also reflects the more important interests at stake in civil matters and quasi-criminal cases. Examples from case law where this standard was utilized include civil cases involving allegations of fraud (*Hardware Mutual Ins v Jacob Hieb Inc* 146 F.2d 447 (8th Cir 1945), proceedings for involuntary commitment to a mental hospital (*Addington v Texas* 441 US 418 (1979)) and deportation proceedings where a more rigorous standard than a mere preponderance of evidence is appropriate (*Woodby v Immigration and Naturalisation Services* 385 US 476 (1966)). This standard is defined as "that measure or degree of proof which will produce in the mind of the juror (or the presiding officer) a firm belief or conviction as to the truth of the allegations sought to be established" (Kagehiro and Stanton "Legal vs Quantified Definitions of Standards of Proof" 1985 9(2) *Law and Human Behaviour* 159-178 163).

3 3 Proof beyond a reasonable doubt

Proof beyond a reasonable doubt is the common standard in criminal proceedings and basically requires that all reasonable doubt about guilt of the accused be removed from the mind of the ordinary person (G:\Standards of proof artikel\Probability, belief, and proof.mht (accessed 2010-06-11)). It does not mean, however, that there must be proof beyond all doubt or proof to an absolute certainty; the proof must rather be consistent with the accused's guilt and inconsistent with any other reasonable hypothesis or conclusion (Loevinger Spring 1992 32 *Jurimetrics Journal* 335). It also does not mean that all intermediate facts in a criminal trial must be proved beyond a reasonable doubt. Every factor bearing on the question of guilt need not necessarily be treated as a separate issue to which the test of reasonable doubt must be distinctly applied (Zeffert and Paizes 105; and *R v Mtembu* 1950 1 SA 670 (A) 679-680). In *R v Sibanda* (1965 4 SA 241 (RA) 246) it was submitted that all the facts taken together should rather prove the guilt of an accused beyond a reasonable doubt and only where there is a particularly vital fact which in itself determines the guilt of the accused, must that particular fact be proved beyond a reasonable doubt.

3 4 Proof to a moral certainty

This standard is also used in criminal proceedings and is a threshold of belief even higher than that of proof beyond a reasonable doubt. Proof to a moral certainty requires presiding officers to be confident enough about their conclusion to rely on it in matters of the greatest personal importance. It is said that this standard of proof falls somewhere between proof beyond a reasonable doubt and the highest possible threshold of proof, absolute certainty (G:\Standards of proof artikel\Probability, belief, and proof.mht (accessed 2010-06-11)).

3 5 Absolute certainty

Proof to an absolute certainty is actually a fiction, as we can never prove anything conclusively (100%). Also, the process whereby we assemble evidence to raise the probability of the proposition in question as high as possible does not guarantee that we will reach 100% probability in each and every instance (G:\Standards of proof artikel\Probability, belief, and proof.mht (accessed 2010-06-11)).

3 6 Intime conviction

In Civil Law countries, like France, a concept of intime conviction is generally used as a standard of proof (Clermont 2009 33 *Vermont LR* 471; and Taruffo "Rethinking the Standards of Proof" 2003 51(3) *The American Journal of Comparative Law* 659-677). This standard is based on the presiding officer's intuitive conviction and requires a particular fact to be so probable that an inner and deep-seated conviction that the fact is indeed true is created (Clermont 2009 33 *Vermont LR* 471; Clermont and Sherwin "A Comparative View of Standards of Proof" 2002 50(2) *The American Journal of Comparative Law* 243-275 243). Compared to the previous five standards of proof discussed in this section intime conviction seems to offer a more subjective approach to standards of proof. This high standard is said to apply in both civil as well as criminal cases (Clermont 2009 33 *Vermont LR* 471; In Japan a similar high standard of proof is also said to apply on both civil as well as criminal cases; Clermont "Standards of Proof in Japan and the United States" 2004 37 *Cornell International LJ* 263-284). Clermont argues that this difference in the standard of proof between common law countries and civil law countries primarily lie in the latter's quest for legitimacy in a social structure wary of the judiciary and an avoidance of notions of probabilism, as the intime conviction standard attempts to stray clear from the question, which facts are more probable than not (Clermont 2009 33 *Vermont LR* 471). In German civil procedure this standard is described as follows: "The judge must always content himself with a degree of certainty that is appropriate for practical life, one which silences doubts without entirely excluding them ... a rather high degree of probability is called for, and there is a tendency toward at least a verbal equation of the civil and the criminal standard" (Zivilprozes Ordnung §286.1; and Clermont and Sherwin 2002 50(2) *The American Journal of Comparative Law* 243).

4 The application of standards of proof as a cognitive process

Different theories on the application of standards of proof as the law's contribution to the mental process of decision-making and evidence processing will now be considered. There are many theories ranging from the psychological processes of evidence evaluation to the Bayesian approach of evidence processing. This section will, in line with the discussion thus far, rather focus on scientific theories relating to this cognitive reasoning process.

4 1 Computational and dialectical argumentation theories

The modelling of the adversarial argument has been one of the main research topics in the study of Artificial Intelligence and the Law (Prakken "On Formalising Burden of Proof in Legal Argument" 1999 *Jurix* 85-98 85; and Atkinson and Bench-Capon "Argumentation and Standards of Proof" June 2007 *ICAIL* 107-116 107). Various frameworks have been developed to explain the process of legal reasoning. Freeman and Farley, for example, suggested a computational model of dialectical argumentation as a basis for the study of legal reasoning (Atkinson and Bench-Capon June 2007 *ICAIL* 107-108; Farley and Freeman "Burden of Proof in Legal Argumentation" 1995 *ICAIL* 1-165).

In terms of this model Freeman and Farley first identified warrant types that relate premises to conclusions: *sufficient* indicated premises that strictly imply the conclusion; *default* referred-to premises that usually imply the conclusion; and *evidential* referred-to premises that give some reason to believe the conclusion. They then submitted that arguments are formed by applying rules with these warrants in four ways: *modus ponens* (MP) which derives the conclusion from the premise; *modus tolens* (MT) which derives the negation of the premise from the negation of the conclusion; *abduction* (ABD), where the premise is derived from the conclusion and *abductive contraposition* (ABC), where the negation of the premise is derived from the negation of the conclusion (Atkinson and Bench-Capon June 2007 *ICAIL* 107-108; and Farley and Freeman 1995 *ICAIL* 1-165).

Applying MP or MT to sufficient rules yields a *valid* argument according to this model. The application of MP to a default rule is said to yield a *strong* argument and the application of MP to an evidential rule yields a *credible* argument. Any other application yields a weak argument. Freeman and Farley also recognized five standards of proof. Their five standards of proof related to five degrees of support necessary to rebut a defendable argument – an argument that cannot be defeated only on the given data (Atkinson and Bench-Capon June 2007 *ICAIL* 107-108; and Farley and Freeman 1995 *ICAIL* 1-165). The five degrees of support identified by Freeman and Farley are very similar to the five standards of proof identified in section three above:

- Scintilla of Evidence: At least one weak, defendable argument.
- Preponderance of the Evidence: At least one weak, defendable argument that outweighs the other side's argument.

- Dialectical Validity: At least one credible, defendable argument and the other side's arguments are all defeated.
- Beyond a Reasonable Doubt: At least one strong, defendable argument and the other side's arguments are all defeated.
- Beyond Doubt: At least one strong, valid argument and the other side's arguments are all defeated (Atkinson and Bench-Capon June 2007 *ICAIL* 107-108; and Farley and Freeman 1995 *ICAIL* 1-165).

Gordon and Karacapilidis created the Zeno system for legal argumentation (Atkinson and Bench-Capon June 2007 *ICAIL* 107-108; and Gordon and Karacapilidis "The Zeno Argumentation Framework" 1997 *ICAIL* 10-18). In contrast to Freeman and Farley's warrant types and rules of argumentation Gordon and Karacapilidis presented a dispute on a dialectical graph, where preference between different standpoints are expressed explicitly within the dialectical structure. The dialectical graph is furthermore structured around issues, each of which have choices and options for deciding these issues. Each choice, in turn, has advantages and disadvantages as well as constraints expressing a preference for a certain advantage and/or disadvantage. The advantages and disadvantages to each choice can furthermore be so pivotal that they may become sub-issues each with their own advantages, disadvantages and constraints (Atkinson and Bench-Capon June 2007 *ICAIL* 107-108; and Gordon and Karacapilidis 1997 *ICAIL* 10-18).

Gordon and Karacapilidis also identified five standards of proof. Three of these standards, scintilla of evidence, preponderance of evidence and beyond a reasonable doubt apply to statements of fact and are very similar to Freeman and Farley's framework for the same three standards of proof. The remaining two standards, no better alternative and best choice, are said to relate to the aspirations and values of those involved in the dispute and therefore focus on purpose and preference (Atkinson and Bench-Capon June 2007 *ICAIL* 107-108; and Gordon and Karacapilidis 1997 *ICAIL* 10-18).

- Scintilla of Evidence: The choice has some advantages.
- Preponderance of Evidence: The advantages outweigh the disadvantages given the preference of constraints.
- No better Alternative: No choice is preferred on the basis of the preference of constraints.
- Best Choice: One choice is preferred to every alternative choice on the basis of the preference constraints.
- Beyond a Reasonable Doubt: No disadvantage exists against a particular choice and no advantage exists for an alternative (Atkinson and Bench-Capon June 2007 *ICAIL* 107-108; Gordon and Karacapilidis 1997 *ICAIL* 10-18).

A final framework to consider with regard to the standards of proof in legal argumentation is Gordon and Walton's Carneades framework: "a formal mathematical model of argument structure and evaluation that applies proof standards to determine the defensibility of arguments and the acceptability of statements" (Atkinson and Bench-Capon June 2007 *ICAIL* 107-108; and Gordon and Walton "The Carneades Argumentation Framework: Using

Presumptions and Exceptions to Model Critical Questions" in Dunne and Bench-Capon (eds) *Computational Models of Natural Argument, Proceedings of COMMA 2006, volume 144 of Frontiers in Artificial Intelligence and Applications* (2006) 195-207). In this framework there are four standards of proof pertaining to questions of fact, rather than law:

- Scintilla of Evidence: Evidence supported by at least one defensible positive argument.
- Preponderance of Evidence: The strongest defensible positive argument outweighs the strongest defensible negative argument, if there is one.
- Dialectical Validity: Evidence supported by at least one defensible positive argument, and none of the negative arguments is defensible.
- Beyond Reasonable Doubt: Evidence supported by at least one defensible positive argument, all its positive arguments are furthermore defensible and none of the negative arguments are defensible (Atkinson and Bench-Capon June 2007 *ICAIL* 107-108; and Gordon and Walton (2006) 195-207).

Although these computational models of legal reasoning provide an interesting point of view on the reasoning process whereby evidence is analyzed and evaluated, it is doubtful that these models can really account for the unconscious processes of legal reasoning in any particular matter.

4 2 Probability theory and the standards of proof

In legal disputes a determination about what had happened in the past must be made. And, since it is usually impossible to prove with absolute certainty what exactly happened in the past – as time is irreversible, events unique and any reconstruction of the past at best an approximation – the decision-maker's conclusions will be based on probabilities (Ball "The Moment of Truth: Probability Theory and Standards of Proof" 1960-1961 14 *Vanderbilt LR* 807-830 807; and McCauliff 1982 35 *Vanderbilt LR* 1295-1296). "In other words, because the trier of fact can never be absolutely certain that a particular fact is true, the parties can only persuade him (the decision-maker) to a particular degree of certainty that the fact is *probably* true." Once the decision-maker has made a decision in accordance with the required probability/standard of proof, the finding is regarded as true for the purposes of that particular judgment. This theory of probabilities assumes that human beings naturally act in accordance with this theory's principles when making decisions (McCauliff 1982 35 *Vanderbilt LR* 1295-1296).

The standards of proof in terms of the probability theory, as it was described above, are based on the mathematical theory of probability and have been defined as percentage definitions and viewed as lying along a continuum of guilt. Judge Weinstein in *United States v Schipan* (289 F Supp 43 (EDNY 1968) aff'd 414 F.2d 1262 (2d Cir 1969)), for example, described proof on a balance of probabilities as placed at 50% on a scale from 0% to 100%, measuring the probability that the matter allegedly eventuated. And proof beyond a reasonable doubt has a probability of more than 90%. The threshold probability for clear and convincing proof is said to lie somewhere between 50% and 90% (G:\Standards of proof artikel\Probability, belief, and proof.mht (accessed 2010-06-11)). In the case of *United States v Fatico* (458

F Supp 388, 410 (EDNY 1978)) Judge Weinstein conducted a survey amongst the judges of the Eastern District New York Court about their assessment of the standards of proof. Four standards of proof were used for this survey, evidence on a balance of probabilities, clear and convincing proof, clear, unequivocal and convincing proof and finally, proof beyond a reasonable doubt. In 1981 a similar survey was conducted amongst all active, senior and retired federal judges in the USA (McCauliff 1982 35 *Vanderbilt LR* 1324-1325). Of the 171 judges who took part in the survey twenty-one judges indicated that proof beyond a reasonable doubt should be associated with the percentage 100%, as an indication of the probability that the matter under question actually eventuated. Thirty-one judges estimated proof beyond a reasonable doubt to be at 95% and sixty-five judges at 90% (McCauliff 1982 35 *Vanderbilt LR* 1324-1325). In the same survey 170 judges assigned a percentage value to the standard of proof, clear and convincing proof. Most of the judges indicated that clear and convincing proof should be associated with a 75% probability rate (McCauliff 1982 35 *Vanderbilt LR* 1324-1325).

Another articulation of the standards of proof in terms of the probability theory is that the court does not necessarily attach a percentage of certainty to a standard of proof, but rather abstracts from the probability theory a risk of loss factor. The isolated risk factor is then said to represent the symbolism of each standard of proof. In a preponderance standard the parties bear the risk of an erroneous verdict equally. In a clear and convincing standard the state bears more of the risk than the individual does and in a reasonable doubt standard the state bears almost the entire risk of error (McCauliff 1982 35 *Vanderbilt LR* 1320). But, this quantification of the standards of proof has not received general acceptance: “Of course the law could determine a numerical quantification on the level of doubt which is permissible. But the point is that the law does not do this. It leaves the standard of satisfaction required vague. It requires a credibility statement that the facts in issue occurred beyond a reasonable doubt and not a statistical statement that the probability of the facts in issue is 0.99 or 0.999 and so on” (Jackson “Probability and Mathematics in Court Fact Finding” 1980 31 *Northen Ireland Legal Quarterly* 239 241).

In the 1981 survey many judges complained that the use of percentages in quantifying the standards of proof is misleading as standards of proof deal with qualitative judgments rather than quantitative judgments. Also, that the use of percentages will not bring about greater legal certainty and that it will result in a decision-making process that is mechanical, unrealistic and unknown to law (McCauliff 1982 35 *Vanderbilt LR* 1332). It is submitted in this article that legal standards of proof should never be interpreted probalistically. The probability theory can only be applied if statistical knowledge about prior and conditional probabilities is available and, if such statistical knowledge was available, such information would in fact defeat the whole purpose of evaluating probative material at the end of a trial, a legal process required for making justified decisions (Gordon and Walton (2006)). Also, arguments for and against a particular proposition are rarely independent. In law, therefore, a process of evaluating probative material is required that accrues arguments which do not depend on the assumption that the arguments or evidence is independent (Gordon and Walton (2006)). Cohen, in his monograph (*The Probable and the Provable*) describes this process of analyzing and

assessing the weight of probative material as a process that requires a consideration of the completeness of the body of evidence and the circumstances under which the evidence was gathered. He asserts that this is mandatory if one is to make a finding on its probative value of the evidence (Kaye "Do We Need a Calculus of Weight to Understand Proof Beyond a Reasonable Doubt?" 1986 *Boston University LR* 657-672; and also see Zeffert and Paizes 113-126).

4 2 1 Probability calculations by courts

Courts have, however, made use of probability calculations in certain cases. In the Californian case of *Sindell v Abbott Laboratories* (607 P.2d 924 (1980)) for example, there was a class action against several drug companies to recover damages suffered by the plaintiffs as a result of the administration of the drug, DES, to the plaintiffs' mothers during pregnancy. As all of the defendants manufactured the drug from an identical formula, the plaintiffs were unable to prove which manufacturer was responsible for the particular drug administered to a particular mother. What was known, however, was that six or seven of the manufacturing companies had manufactured about 90% of the drug, while 200 other manufacturers were responsible for the remainder for the DES. The court in this case used the probability theory as follows: The court reasoned that it was very likely that the defending companies did in actual fact manufacture the drug that caused the injuries and that there was only a 10% possibility that other offending manufacturers would escape liability. And for this reason, the injustice of shifting the burden of proof to the defendants to prove that they did not manufacture the drug that caused the injuries was substantially diminished (Loevinger Spring 1992 32 *Jurimetrics Journal* 337). Decisions like these have, however, been criticised for their use of statistical reasoning merely to provide a rationale for the desired result as well as its similarity to the manner in which natural scientists first formulate a conclusion and then test a hypothesis. (Most of these cases are concerned with causation. *Summers v Tice* 199 P.2d 1 (1948); *Ybarra v Spangard* 254 P.2d 687 (1944); *Michie v Great Lakes Steel* 495 F.2d 213 (6th Cir 1974); Hutcheson "The Judgement Inituitive: The Function of the "Hunch" in Judicial Decision" 1929 14 *Cornell Law Quarterly* 274; and Loevinger Spring 1992 32 *Jurimetrics Journal* 339.)

In another case, *Falcon v Memorial Hospital* (462 NW 2d 44 (Mich 1990)), also dealing with causation, damages were claimed from a hospital and a physician for their alleged negligence that contributed to the deceased's death. Expert testimony indicated – based on the survival statistics of other patients in similar conditions – that if the defendants had followed the required procedures the deceased only had a 37.5% chance of survival. In this case damages was awarded for the deceased's lost chance of survival to a maximum of 37.5% of the amount recoverable for wrongful death. The presiding officer here argued that the plaintiffs did not show that the alleged negligence was the probable cause of death, construing probability to be 50% or more. And had there been no negligence, the deceased's life would have been decided by fate, which in this instance was accepted as 37.5%, the survival statistic calculated by expert witnesses. This use of statistics in these

cases was criticised, however, as unreliable, misleading, easily mani-pulated and confusing (Loevinger Spring 1992 32 *Jurimetrics Journal* 340).

While these cases dealt with the objective concept of probability where chances of a particular outcome of a series of like events are calculated, Bayes theorem exemplifies the subjective concept of probability. This theorem basically specifies "the degree of credibility or belief to which a conclusion is entitled on the basis of subjective judgments as to the credibility of the particular items of evidence on which it rests". Such specification is referred to by natural scientists as a confidence interval and in law it refers to the evidence falling within a particular category/standard of proof. Zeffert and Paizes submit that the Bayes's theorem, in theory, provides for an extraordinarily precise tool for measuring the strength of an inference of guilt that flows from the evidentiary fact in question. They also warn, however, that the practical difficulties involved in the use of this theorem – even by those who know how to apply it – are quite complex and thorny to say the least (Loevinger Spring 1992 32 *Jurimetrics Journal* 341; and Zeffert and Paizes 114-115).

An example of a case where subjective concepts of probability wholly influenced the outcome is the Dutch case of Lucia de Berck, a paediatric nurse, who was convicted and sentenced to life imprisonment in 2004 for the murder of seven children and the attempted murder of three children in her care at the Juliana Children's Hospital in The Hague (Kaptein, Prakken and Verheij *Legal Evidence and Proof: Statistics, Stories, Logic* (2009) 41). An expert witness from the Netherlands Institute for the Study of Crime and Law Enforcement testified in the court *a quo* that more children had died on de Berck's shifts than appeared possible by chance. The expert witness placed the odds of her presence being a mere coincidence at one in 324 million. Despite there being little other evidence to convict de Berck, except for traces of toxic substances found in two of the exhumed bodies and which could have been the result of the medical treatments the two children had undergone, de Berck was convicted (Hawkes "Did statistics damn Lucia de Berck?" http://www.independent.co.uk/opinion/commentators/nigel-hawkes-did-statistics-damn-lucia-de-berk-1940735.html (accessed 2010-06-11)).

The Arnheim appeals court acquitted her on 14 April 2010 after the Dutch Supreme Court, which had upheld her conviction in 2006, ordered that her case be reviewed in 2008. The Arnheim appeals court ruled that some of the patients had died of natural causes and that de Berck could not be held accountable for their deaths (http://www.abc.net.au/news/stories/2010/04/15/2873629.htm?section=justin (accessed 2010-06-11)). According to Kaptein, Prakken and Verheij the Small Chance Instinct – a basic human intuition based on the Small Chance Principle – may have been responsible for the verdict in the de Berck case. The Small Chance Principle states that when the chance is very small that *p* would occur, then it is reasonable to believe that *p* will not occur. And in the de Berck case the odds were just too close for comfort: "The chance that all those incidents happened during one person's shifts just by accident was too small for comfort. That is what the nurses, doctors and the managing director of the Juliana Children's Hospital believed and that is what in the end the prosecution, the district court and the Court of Appeal took for granted" (Kaptein, Prakken and Verheij 41).

The events in the de Berck case are a clear warning of the pitfalls of such probabilistic reasoning in law (also see the case of *R v Adams* [1996] 2 CR App R 467; and Zeffert and Paizes *supra* 116). Attaching too much weight to analyzes of likelihoods and its associations furthermore cloud the real substantive legal issues that should actually form the basis of legal reasoning. It is suggested that the real problem with judgments based on statistic and probability calculations is that they are inherently inapplicable of application to individual scenarios. While science can deal with events that are generally replicable and occur in a series of like events that justify a conclusion expressed in statistical/probability terms, law on the other hand, deals with individual and unique cases that are not always subject to such frequency calculations (Loevinger Spring 1992 32 *Jurimetrics Journal* 342). However, the application of such probabilistic reasoning, as the Bayes's theorem suggests, does provide us with an enriched perspective of the general working and application of inferences, probability and the probative value of material in natural sciences and law (Zeffert and Paizes 116-117).

4 3 Standards of proof as reflections of constitutional due process

Although the constitutionality of a particular onus of proof has come under scrutiny in quite a few cases, (*S v Shanganse* 1994 2 SACR 659 (D); *S v Zuma* 1995 2 SA 642 (CC); *Joubert v Venter* 1985 1 SA 654 (A); *Mabaso v Felix* 1981 3 SA 865 (A); *Neethling v Du Preez*; *Neething v The Weekly Mail* 1994 1 SA 708 (A); *Gardener v Whitaker* 1995 2 SA 672 (E); *Holomisa v Argus Newspapers Ltd* 1992 2 SA 588 (W); and *Potgieter v Kilian* 1996 2 SA 276 (N)), the role that standards of proof play as a reflection of constitutional rights and constitutional due process has not been directly considered in South African case law. However, in a USA case, *Mathews v Eldridge* (424 US 319 (1976)), the Supreme Court identified three considerations that courts must weigh to determine what procedures due process requires: the private interests to be determined by the proceeding; the risk of error created by the state's proceeding; and the state's interest in using that particular type of proceeding. These considerations also echo the societal importance attached to a decision in a particular case. As standards of proof, analyzed from the point of view of the decision-maker in a legal dispute, mirror "the degrees of belief and the operation of probability theory, the same standards examined from the point of view of societal values focus on the risk that the decision is incorrect" (McCauliff 1982 35 *Vanderbilt LR* 1319). And, the standard of proof applied in a particular case should consequently reflect the the protection of societal values. "There is always in litigation a margin of error, representing error in factfinding which both parties must take into account. Where one party has at stake an interest of transcending value – as a criminal defendant his liberty – this margin of error is reduced as to him by the process of placing on the other party the burden of persuading the factfinder at the conclusion of the trial his guilt beyond a reasonable doubt" (*Speiser v Randall* 357 US 513 (1958) 525-526; and McCauliff 1982 35 *Vanderbilt LR* 1320).

In *In re Winship* (397 US 358 (1970)) for example, the use of the reasonable doubt standard in criminal matters was described as follows: "Use of the reasonable doubt standard is indispensable to command the respect

and confidence of the community in applications of the criminal law. It is critical that the moral force of the criminal law not be diluted by a standard of proof that leaves people in doubt whether innocent men are being condemned. It is also important in our free society that every individual going about his ordinary affairs have confidence that his government cannot adjudge him guilty of a criminal offence without convincing a proper factfinder of his guilt with utmost certainty" (McCauliff 1982 35 *Vanderbilt LR* 1321). And in *Jackson v Delaware* (L & WRR 111 NJL 487, 170 Atl 22, 23-24), the civil standard of proof, proof on a balance of probabilities, was described as "the mischief of a potential erroneous conclusion that is not deemed remediless, it is not necessary for the minds of the jurors to be freed from all doubt, it is their duty to decide in favour of the party on whose side the weight of the evidence preponderates, and according to the reasonable probability of the truth" (*Jackson v Delaware supra* 23-24; and Ball 1960-1961 14 *Vanderbilt LR* 816).

Ruling out chance or another explanation for an eventuation is a necessary and essential step in the factfinding process. The right to a fair trial as set out in section 35 of the Constitution therefore necessitates that the private interests of the parties to the dispute and under determination in the particular proceeding, as well as the risk of error and the law's rationale for applying a particular standard of proof all reflect a just and fair process for all the stakeholders concerned. Such an open, resolute and transparent process of analyzes and evaluation of evidence is in line with the principle of legality and also uphold the societal importance attached to legal decisions.

5 Conclusion

While quantified definitions of the standards of proof may be more effective when giving jury instructions or explaining legal terms to people with no legal education, the standards of proof and the process of analysis and assessment of probative material cannot be simplified to a mere mathematical calculation. Especially in law, the evaluation of evidence and the final conclusion/judgment are said to come down to faith in the operation of the human mind trained in the discipline of law and supported by further pragmatic experience (Loevinger Spring 1992 32 *Jurimetrics Journal* 344; and Clermont 2009 33 *Vermont LR* 477). "Proof ultimately depends on the ability of the human mind to make appropriate and useful distinctions and connections among data or items of evidence" (Loevinger Spring 1992 32 *Jurimetrics Journal* 343). While standards of proof do, to a certain extent, concern themselves with probability, it should be kept in mind though that statistical significance and probability calculations are not the same as substantive significance (Lempert "The Significance of Statistical Significance" 2009 *Law & Social Inquiry* 225-249).

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