

STANDARDS OF PROOF AND THE LIMITS OF LEGAL ANALYSIS

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ABSTRACT

This article was prepared for a conference in Girona, Spain, on Standards of Proof and Scientific Evidence. The article demonstrates, first, the analytical power under certain limiting assumptions of treating burdens of persuasion as conventional probability measures. It then demonstrates the remarkable inadequacy of that conceptualization once the limiting assumptions are relaxed as empirical descriptions of the relevant phenomena, and further that this inadequacy suggests that the analytical tools being employed misconceive rather than enlighten the object of inquiry. Alternative ways of analyzing the objects of inquiry are briefly proposed and discussed.

KEYWORDS

Standards of proof, scientific evidence, burden of persuasion, probability, legal analysis.

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1. *The Significance of the Burden of Persuasion* – 2. *The Limits of Legal Analysis*.

Generally speaking, three burdens can be imposed upon a party at trial: the burden of pleading, the burden of producing evidence, and the burden of persuasion. Burdens of pleading specify the conditions under which factual/legal issues will be deemed to be included within a litigated case. They can be distributed any way the law maker prefers, although usually they are allocated to the party asking for a change in the *status quo*. There are exceptions to this general rule designed to respond to this or that policy concern, such as the requirement that criminal defendants plead specifically an alibi even though an “alibi” is nothing but a general denial. Burdens of pleading are significant in that they create the scaffold of the trial; but they pose no interesting conceptual challenge, and thus they can be put aside¹.

The remaining burdens – burdens of production and persuasion – together comprise what is normally meant by the phrase “standards of proof”. Various countries give differing names to these two concepts, such as the evidential burden and the standard of proof, but whatever their titles the underlying concepts are clear. Parties can be required to produce evidence or face losing an issue or the entire case. Once a satisfactory evidentiary base is compiled, decision has to be reached in the face of uncertainty, and the burden of persuasion specifies the decision rule to be employed. These are universal analytical requirements that are entailed by the conceptual nature of litigation². Evidence must be produced if a disinterested third party is to decide the facts of the matter, and decision is virtually always under uncertainty.

Although it remains conventional to distinguish the burden of production from the burden of persuasion, Prof. McNaughton long ago demonstrated that the burden of production is a function of the burden of persuasion³. The measure of whether a burden of production is satisfied is, following the presentation of evidence, whether there remains a triable factual question – whether, in other words, further proceedings regarding that fact are in order. That depends both on the state of the evidence, but critically as well on the burden of persuasion. If a party with the burden of production produces some evidence of a factual issue, but no reasonable person could find for that party, given the burden of persuasion, then it is pointless to expend further resources on that factual issue and judgment should be entered accordingly (however this is done in each idiosyncratic procedural context). Thus, the critical conceptual

* Paper originally presented in the conference “Standards of Proof and Scientific Evidence”, Universitat de Girona, Girona, Spain, May 25-26, 2011. I am indebted to my good friends, co-authors, and somewhat in this article good humored foils, Larry Laudan and Michael Pardo, for commenting on an earlier draft of this paper.

¹ The *Twombly* revolution in federal pleading practice actually brings burdens of pleading under the coverage of the central thesis offered in this article by directly making the adequacy of the pleadings depend on a cost/benefit analysis of allowing the case to proceed, where part of the analysis is the probability of success on the merits. ALLEN, GUY 2010.

² Some continental theorists have tried to deny this on the ground that the standard of “intime conviction” avoids error, but this is literally impossible unless appointment as a judge in Europe creates omniscience, which I doubt. It is thus a positive development to see astute observers such as Jordi Ferrer Beltrán notice the limits of the slogan. See, e.g. FERRER BELTRÁN 2006, 18 (ms.).

³ MCNAUGHTON 1955, 1382.

issues of “standards of proof” reduce to the meaning and application of the burden of persuasion.

I intend to examine those conceptual issues in this article. First, I will demonstrate that the legal significance, and explanatory power, of the burden of persuasion ranges far beyond simply determining the implications of burdens of production. In the first part of the article, I will assume that the conventional understanding of burdens of persuasion as being probability measures is accurate. With the aid of that assumption, I will show that the burden of persuasion is one of the critical conceptual tools for understanding the litigation process. Second, I will address the current controversy over the substantive content of the burden of persuasion and the related controversy over the relationship between burdens of persuasion and errors. This analysis will include critically examining the assumption that the burden of persuasion is a probability measure. Indeed, I will attempt to demonstrate that the conventional understanding of the burden of persuasion and the recent efforts to respond to its shortcomings are inadequate as empirical descriptions of the relevant phenomena, and further that this inadequacy suggests that the analytical tools being employed misconceive rather than enlighten the object of inquiry.

One final introductory word. Much of the legal scholarship on burdens of persuasion, as on virtually all topics, is not meant to be descriptively adequate or contribute to discovery of knowledge, but instead is normative. My effort here is to the contrary. I will try to uncover certain interesting aspects of the problem to advance knowledge about them, and I will not editorialize about these matters. To be sure, a clearer understanding of the facts of the matter may yield more compelling normative analyses, but my objective here remains understanding not editorializing about the matters under investigation. Perhaps ironically, one implication of this analysis will be that different tools of legal analysis must be employed if one is to gain deeper understanding of legal phenomena. Of course, whether a deeper understanding is a desideratum is entirely subjective, and my argument will be IF this is a desideratum, THEN certain things follow.

1. *The Significance of the Burden of Persuasion*

As we have already seen, the burden of persuasion determines the meaning of the burden of production. It is also the key to understanding discrete jury control devices, such as affirmative defenses, presumptions, inferences, and judicial comment and notice, as well as more macro control devices such as, directed verdicts, summary judgments, and judgments as a matter of law. In each case, a burden of persuasion is directly or indirectly being imposed on a party or modified as it applies to a party. For reasons that will soon become clear, it is useful to sort out direct manipulations of the burden of persuasion from indirect manipulations. I begin with the former.

There are numerous direct allocations of the burden of persuasion. The substantive law determines who has the burden of persuasion through its articulation of elements and defenses, the only difference between the two being who has the burden of persuasion. In the Anglo-American realm, this allocation often occurs explicitly in statutory or common law rules. There is nothing conceptually difficult about this process, although there can be reasonable disagreements as to who should bear what burden. For example, should lack of contributory negligence be an element of a negligence cause of action or a defense to it? Should criminal defendants have to prove their own insanity or should the government have to prove sanity beyond reasonable doubt? There can be both moral and practical considerations favoring either, but once the decision is made its implementation is straight forward. If the plaintiff or state bears the burden of persuasion on an issue, it is labeled an element; if the defendant does, it is labeled a defense (sometime an “affirmative defense” to distinguish such things as contributory

negligence from a straight forward denial). In addition, the law can mix and match burdens of production and persuasion. There is nothing incoherent about requiring the defendant to bear a burden of production on an issue and the plaintiff to then bear the burden of persuasion. Of course, while coherent, it is unclear what is accomplished by this, as again the burden of production is a function of burdens of persuasion. Thus, only cases literally in equipoise should come out different, which is surely an exceedingly small set⁴.

Allocations of burdens of persuasion, and thus the creation of defenses, also occur somewhat obscurely but still directly through the use of presumptions. This is done with legal language to the effect that “upon proof of X, a presumption of Y arises that must be rebutted” by one party or the other. The language of “presumptions” is ubiquitous but pointless; all this amounts to is the direct allocation of a burden of persuasion. There are other uses of “presumption” language, but in each case the language is truly epiphenomenal, merely obfuscating rather simple relationships. In general, presumptions serve four different functions, three of which directly allocate or affect burdens of persuasion. They are used to articulate legal rules – these are the so-called irrebuttable presumptions, as just mentioned to allocate directly burdens of persuasion, and to allocate burdens of production, which as we have seen involve burdens of persuasion⁵. I will discuss these three uses of “presumption” language immediately below, and will then turn to the fourth use of presumptions – to provide for inferences and comments on the evidence. This use of the term involves indirect manipulations of the burden of persuasion and will be discussed in that context.

For various reasons, the law provides direct resolution of what might otherwise be contested facts. For example, proof that a person drove faster than the speed limit or with more than a certain amount of alcohol in his veins or evidence that a person violated a safety statute were at one time said to create an irrebuttable presumption of negligence. All this meant, however, is that the proof of the underlying condition – speeding, drunk driving, violating a safety statute – satisfied the elements of the cause of action, and thus satisfied whatever burden of persuasion might otherwise have been a play. In other instances, similar proof was held to create a rebuttable presumption, such as the presumption that a mailed letter was received by the addressee. This conclusion could be rebutted either by showing by a preponderance to the contrary, or by showing that a reasonable person could conclude by a preponderance to the contrary – and this is the critical distinction between the allocation of a burden of persuasion and a burden of production. In each instance, though, plainly the central feature is one or another type of direct manipulation of the burden of persuasion.

This exact same point applies to the various macro control devices, such as directed verdicts, summary judgments, judgment notwithstanding the verdict, and new trial orders, as has recently been demonstrated by Michael Pardo⁶. Each of these should be entered only when there is no jury issue or a jury reached an indefensible result, but when that is the case will depend on the burden of persuasion. New trial orders allow some greater latitude to the trial judge to handle second order proof problems – how confident is the judge that only one result is defensible or an indefensible result was reached? If quite confident, directed verdicts, summary judgments, or judgment notwithstanding the verdict are entered. If less but still reasonably confident, a new trial order permits the check of a second jury. The important point here, though, is that this entire analysis is driven directly by burdens of persuasion.

⁴ The way things work out in practice may differ from theory. Some studies suggest that preponderance of the evidence is understood as considerably higher than a .5 probability. Unfortunately, these studies do not show any operational consequence to the verbal descriptions. See, e.g., SIMON, MAHAN 1971; KAGEHIRO, STANTON 1985.

⁵ ALLEN 1981.

⁶ PARDO 2010.

There are indirect manipulations of the burden of persuasion as well. Many evidentiary devices as well as the admission or exclusion of evidence can affect the relative burden of persuasion even though the explicit burden of persuasion may remain unaffected⁷. Comment on the evidence, instructions on inferences (which are comments on the evidence), exclusion of relevant evidence or the admission of misleading evidence all change the relative burden of persuasion⁸. The fourth form of presumptions noted above does as well. It is used to create disguised comments/inference instructions through “presumption” language. A typical instruction is that “on proof of X a presumption of Y arises that is evidence of Y”. There is no possible meaning of “a presumption is evidence of some fact” except to encourage the fact finder to find the fact upon finding the basic fact of the presumption. This, obviously, is a comment on the evidence.

The effect of these various evidentiary manipulations on burdens of persuasion – what it means to affect the “relative burden of persuasion” – can be seen by comparing two cases in which the only distinguishing feature is that one does not contain one of these manipulations and the other does. Assume two cases with essentially identical facts that involve the crime of knowing possession of stolen goods where the only evidence of knowledge is the fact of possession of recently stolen goods. Assume further that the judiciary has come to believe that the possession of recently stolen goods is very highly correlated with knowledge of the nature of the goods, but the judges also believe this knowledge is not widely possessed by the general populace who make up juries. And last, assume that in one case the judge provides a judicial comment on the evidence or an inference instruction on the relationship between possession and knowledge, while in the other the judge says nothing about the matter.

In the case without judicial comment, the jury might conceivably convict, but the chance of acquittal is higher than in the second case, in which the judge explains the implications of possessing recently stolen goods. The judge’s comment increases the chance of conviction by enhancing the effect of the state’s evidence. In order for the defendant to have the same chance of acquittal in the second case as in the first, the defendant would have to produce more persuasive rebuttal evidence than that advanced in the first case. In other words, because of the comment on the evidence, the defendant’s task – his or her “burden of persuasion” – has been altered and made more difficult to meet. Although the formal relationship between the state and the defendant has remained the same – the jury has applied the reasonable doubt standard in each case – the comment has modified the relative burdens of persuasion by altering the factual matrix within which the jury reached its decision. In the case without the comment, there is a greater chance of acquittal than the case with the comment, unless the defendant responds with more evidence. This demonstrates that the effect of judicial comment is to change the relative positions of the parties by modifying the relative burden of persuasion that a party bears on an issue, just as with affirmative defenses and placement of the burden of production. The exclusion of relevant evidence and the admission of irrelevant but misleading evidence has exactly the same consequence, as whoever is adversely affected by the evidentiary decision must do more to meet what the burden of persuasion would have been absent the judicial intrusion into the inferential process⁹.

One objection to this analysis should be noted and resolved. That objection is that the burden of persuasion is on one party and not the other, and thus it may seem to make no sense to talk about shifting the relative burden of persuasion. This conventional view is false. Burdens of persuasion are reciprocal. To say that the plaintiff bears the burden of proving the case by a

⁷ This phenomenon was first identified in ALLEN 1980. Larry Laudan refers to this in LAUDAN 2010, 11 (ms.).

⁸ See, ALLEN 1980, 332-339. Some of what follows borrows heavily from that source.

⁹ So, too, does the admission of relevant evidence and the exclusion of irrelevant evidence, but presumably these activities move the decision maker to the idealized correct decision.

preponderance is isomorphic to the defendant having to show that the evidence does not show by a preponderance that the plaintiff deserves to win, or, taking out the negative, that there is at least a .5 chance that the defendant's case is true. Even in criminal cases where it is said, erroneously, that defendants bear no burden of persuasion on elements, they actually do. Again, the statements are equivalent that the prosecution must prove an element beyond reasonable doubt and that the defendant must show there is a reasonable doubt.

In sum, the burden of persuasion conceptualized as a conventional probability measure has enormous explanatory power. It allows for the meaning of the term "presumption" to be unpacked¹⁰; it allows a unified analysis of evidentiary and procedural devices¹¹; and it even permits order to be given the complexities of the constitutional requirement of proof beyond reasonable doubt in the United States¹². However, it is increasingly clear that there are limits to the accuracy and utility of modeling the burden of persuasion as a conventional probability measure. That, in turn, raises doubts about the tools of legal analysis that are ubiquitously employed by legal analysts, or alternatively about the adequacy of the conception of the phenomenon they are studying. I turn now to these issues.

2. *The Limits of Legal Analysis*

The attraction of a probabilistic analysis of burdens of persuasion is obvious. It is consistent with an equally attractive conceptualization of the evidentiary process as the updating of probabilities in the light of new evidence. Together, the two appear to explain both the evidentiary process at trial and the application of the decision rule at the end of the trial. Notwithstanding their appeal, the empirical and analytical inadequacy of these conceptualizations has become quite clear. For example, burdens of persuasion can play their allotted role in these conceptualizations only if they involve relative frequencies (how else can one say anything about errors?), yet the only interpretation of probability theory that has any possible explanatory power for juridical proof is subjective belief states. There is virtually never knowledge of relative frequencies at trial, DNA being an interesting exception to be sure; nor do either the propensity or logical theories of probability have any application¹³. The subjective theory is obviously false as a descriptive matter in the United States; no fact finder is instructed to consult his or her subjective belief states or personal utilities. They are instructed, sensibly enough one might think, to find the facts. Moreover, the structure of trial is radically inconsistent with the demands of subjective probability theory. Fact finders are instructed not to update in the light of new evidence, and in any event the updating would be computationally intractable¹⁴. Whatever the normative attraction of subjective theories of probability, or other uses they may serve (such as heuristics), they are empirically inadequate descriptors.

There are further difficulties. Larry Laudan has launched a multi-faceted attack on the meaning of proof beyond reasonable doubt, in which it is conceived as a high probability¹⁵. Part of his attack makes use of joint work that he and I have done that establishes that the common understanding of the justification of burdens of persuasion generally (not just in criminal cases) is completely unconvincing¹⁶. That justification is to allocate errors consistent with various policies.

¹⁰ ALLEN 1981.

¹¹ PARDO 2010.

¹² ALLEN 1980.

¹³ For a discussion of theories of probability, see GILLIES 2000.

¹⁴ ALLEN 1997.

¹⁵ LAUDAN 2006.

¹⁶ ALLEN, LAUDAN 2008; LAUDAN, ALLEN 2010; ALLEN, LAUDAN 2011.

In civil cases, the normal policies are to treat the parties equally and to reduce the total number of errors. In criminal cases, the policy is to protect innocent people by making it hard to convict anyone, and this supposedly is done through skewing errors in favor of acquitting the guilty (the mantra being that it is ten times worse to convict an innocent person than acquit a guilty person).

Although these slogans and ways of thinking have been around for perhaps centuries, it is plain that they suffer from irremediable defects. First, there are four decisions that can be made at trial, and all have social benefits or costs. In addition to errors, correct decisions can be made. Neglecting correct decisions is perverse. For example, in civil cases, the error equalization policy is satisfied by making errors in every single case, so long as the base rates of cases that go to trial include roughly the same number of deserving plaintiffs and defendants. Similarly, in criminal cases, the *ratio* of 10 incorrect acquittals to one incorrect conviction is satisfied by 99 out of every 100 cases being wrongly decided. Furthermore, without knowledge of the base rates of deserving parties that go to trial and the relationship between the assessments of fact finders and true states of affairs¹⁷, there is literally no way to predict the effect of a burden of persuasion on correct or incorrect decisions. If everyone who goes to trial is guilty, for example, there can be no convictions of the innocent, no matter how low the standard of proof. The conventional discourse on burdens also assumes a static system, whereas in fact it is dynamic. One aspect of this dynamism is that parties decide which cases to take further into the procedural system, and can adjust their decision in light of changes in the rules. Thus, the simple assumption that lowering the standard of proof in criminal cases will cause more errors of convicting the guilty, or any other suggested cause and effect relationship between burdens and outcomes, is obviously not analytically true; it depends on how the system responds to the change¹⁸.

The problems with these conventional modes of analysis press even more deeply. Trial decisions are only one part of the output of the legal system. Parties negotiate outcomes in both civil and criminal cases. They do so in the shadow of trials, among other things, but the outcomes in those cases are obviously part of the total social welfare effects of a legal system. More plainly put, it could be the case that quite random outcomes at trial or relatively high costs are socially optimal because they encourage party settlement¹⁹.

The empirical inadequacy of the conventional accounts of burdens of persuasion has generated three recent efforts to substitute an alternative theory. Two of those, created respectively by Larry Laudan and Jordi Ferrer Beltrán, are explicitly normative rather than positive, but they nonetheless are interesting in their implications for present conceptualizations of burdens of proof. The third, by Michael Pardo and myself, is explicitly positive, and while that is a virtue from my perspective, it has other interesting limitations. I will briefly explore these three theories and then turn to the limits of conventional legal analysis.

Larry Laudan's recent work extends his many complaints about the concept, such as it is, of proof beyond reasonable doubt²⁰. He complains, accurately, about its remarkable ambiguity and in addition notes that it is "preposterous" because of its subjectivity²¹. He reminds us of his

¹⁷ For example, working with a probabilistic conception, one needs to know what the relationship is between findings of the probability of liability and actual liability. Implicit in the conventional discourse is that a finding that the probability of liability is .8 means that in eight out of ten similar cases, the true facts are consistent with liability. However, there could be any relationship at all between fact finders' findings of probability and true states of affairs. In the set of all cases where fact finders find there to be a .8 probability of liability, it could be true that all cases in that subset are cases where no liability should be found.

¹⁸ Laudan and Ferrer Beltrán assert to the contrary, but plainly error rates cannot be deduced from the decision rule alone. See FERRER BELTRÁN 2006, 14, in particular n. 12 (ms.), asserting that the decision rule mediates the probability of Type I and Type II error. This is not analytically true in the legal context. See also, LAUDAN 2006, 9-11.

¹⁹ For discussion of this point, see ALLEN 2011; ALLEN, LAUDAN 2011.

²⁰ LAUDAN 2010. See also LAUDAN 2006, ch. 6.

²¹ LAUDAN 2006, 6 (ms.).

previous proposal of a way to understand what proof beyond reasonable doubt should mean:

«It rests on the insight emerging from statistics and the philosophy of science that a powerful test of the truth of any empirical hypothesis, H, is its ability to account for apparent facts or data that seem utterly unintelligible if H were false. Applied to the legal context, the idea would be that the prosecution's claim that the defendant is guilty acquires high plausibility just to the extent that some pertinent evidence has been established as *prima facie* true that can be readily accounted for if the defendant is guilty but that would be highly unexpected if the defendant were innocent. If some of the important features of the case that the guilt hypothesis can make sense of are likewise compatible with an hypothesis of innocence, then the prosecution's case is insufficiently strong to warrant a conviction. Likewise, if there are any pertinent facts that make sense only on the hypothesis of innocence, then an acquittal is called for. In short, this proposed standard demands that a conviction is warranted if and only if a). the hypothesis of guilt can explain most of the salient facts of the case, and b). the innocence hypothesis can account for no important evidence that is inexplicable on the guilt hypothesis. Just as we say that a scientific hypothesis that makes no surprising, corroborated predictions – unanticipated by its rivals – is not very credible, so a guilt hypothesis not backed up by very surprising evidence in its favor lacks the strong empirical support that should be a *sine qua non* for a conviction»²².

Laudan proceeds to acknowledge that the distributional consequences of a proposed definition of beyond reasonable doubt must be taken into account in addition to the attractiveness of the definition in the abstract. Nonetheless, I will focus just on the proposed definition, for, notwithstanding its creativity, I believe it is further evidence of the limits of conventional analysis. And in any event, as noted above, the distributional consequences of any rule or rule change is an empirical rather than analytical question.

The essential analytical move Laudan makes is to search for a decision rule from a related discipline to substitute for the inadequate legal decision rule, and in this case he takes it from generalizations about the progress of science. There are two difficulties. First, there is only a casual relationship between the typical activities of scientific inquiry and that of the legal system. Second, Laudan looks to the wrong phase of science, that of discovery or justification, rather than to the more analogous phase of application. I discuss these two points in turn.

Consider the differences between the standard trial and the research activities of most scientific fields²³. At trial, the effort virtually always is to determine what happened. The purpose is not to uncover general causal laws, although general causal laws may be and often are invoked as evidence that some event occurred. In most scientific efforts, the data are not ambiguous, although their causes are generally puzzling. What actually happens, such as particles have mass or are attracted to each other, is the starting point for attempting to explain why it happened (such as the search for the Higgs boson) – the search for the general causal law, in other words. Experiments can be run and rerun, and often tweaked along the way, in order to uncover a possible explanation. In the law, exactly the opposite obtains. Inconsistent primary data (“the light was red”-“no, it was green”) are the norm, and replication is generally impossible. Controversy always settles on what happened. Why something happened (whatever did happen) may be disputed, and parties may advance varying and conflicting generalizations, scientific or otherwise, for the benefit of the fact finder, but they will be advanced in an inferential structure leading to a conclusion about a fact or series of facts rather than about a universal, a principle, or a theory.

²² LAUDAN 2006, 7-8 (ms.).

²³ The next few paragraphs rely on ALLEN 1994.

Two other significant differences between science and law obtain. Scientific knowledge is organized in a top-down, deductive fashion. Scientific inquiry focuses on either systematizing further the deductive structure of preexisting knowledge through the elimination of anomalies (empirically or theoretically) or on the modification or replacement of the conceptual structure of the field. The differences between these activities caused quite a stir in the philosophy of science half a century ago²⁴, but the similarities of their respective practitioners is remarkable. They share a well-organized body of substantive knowledge and methodological approaches. They disagree, but over well-defined issues. Even those assaulting the conceptual foundations of a field typically share with those doing work within a field methodological and mathematical principles, agree on what counts as evidence, and are able to express their scope of disagreement comprehensibly.

This description of the activity of scientific research does not describe factual inquiry in the legal process. The difference is not that scientific inquiry is highly complicated and lay judgments about ordinary life quite simple, but the exact opposite. Scientific progress in large measure proceeds through the simplification of problems, in particular through controlling as many variables as possible. Judgments about ordinary events, by contrast, virtually never are and cannot be recast as the results of controlled experiments. Too many variables are constantly and necessarily in play. And factual judgments at trial are even more resistant to domestication because the complicating features of the trial process are draped over the bubbling cauldron of real life.

Consider a simple example I constructed some years ago:

Suppose a witness begins testifying, and thus a fact finder must decide what to make of the testimony. What are some of the relevant variables? First, there are all the normal credibility issues, but consider how complicated they are. Demeanor is not just demeanor; it is instead a complex set of variables. Is the witness sweating or twitching, and if so is it through innocent nerves, the pressure of prevarication, a medical problem, or simply a distasteful habit picked up during a regrettable childhood? Does body language suggest truthfulness or evasion; is slouching evidence of lying or comfort in telling a straight forward story? Does the witness look the examiner straight in the eye, and if so is it evidence of commendable character or the confidence of an accomplished snake oil salesman? Does the voice inflection suggest the rectitude of the righteous or is it strained, and does a strained voice indicate fabrication or concern over the outcome of the case? And so on.

The list of relevant variables goes far beyond credibility issues, of which demeanor is only one. When a witness articulates a proposition, the fact finder must determine what the proposition is designed to assert and what the fact finder believes it asserts. That task, too, involves an immense number of variables. In addition, the fact finder will possess some knowledge based on its observations leading up to the first articulated proposition by a witness, acquired from the lawyers for example. And there are many more examples. For the law to proceed as a science would require that many of these variables be in a deductive structure with their necessary and sufficient conditions spelled out. No such structure could be created; it would be too complex²⁵.

The second difference is equally critical. Scientific inquiry focuses on what fruitfully can be explored with the techniques of modern science. If a question does not yield to those techniques, such as what happened before the Big Bang, it is simply ignored. Moreover, there is no need to decide the answer to an experimental question. If the experiments render ambiguous results, or there is worry about some uncontrolled variable, or whatever, more work can be done

²⁴ The major players in this drama were KUHN 1962; POPPER 2002. For a compendium of perspectives on the problem, see SUPPE 1977.

²⁵ ALLEN 1994, 626.

until the investigators are more or less satisfied with the results. The law does not have the luxury of picking its disputes. Whatever the problem is, it must be dealt with. Nor does it have the luxury of postponing decision indefinitely, because not to decide is to decide. Legal disputes involve arguments over whether to modify or preserve the *status quo*. Not to decide typically leaves the *status quo* unmodified and thus one side obtains what it desires.

In sum, it is not at all obvious why a decision rule from such a radically different intellectual enterprise can usefully be imported into the law. Even were one inclined to do so, the decision rule from the enterprise of discovery, which is what Prof. Laudan proposes, seems to be the wrong one. The sorts of variables that he identifies are the ones many scientists and philosophers of science think best assist in the discovery of new scientific knowledge. If a new and purportedly better explanation of some phenomenon is offered, it is persuasive if that explanation makes surprising predictions that are then confirmed, such as Einstein's that light will bend around the sun²⁶. But for the most part trials do not involve surprising predictions; they involve the most mundane of disputes such as who is telling the truth and who is lying²⁷. To make a conviction depend on the production of "very surprising evidence" that is explained by creative, startling, or counter-intuitive hypotheses, or any other type of out of the ordinary hypothesis, is to doom prosecutors to virtually no convictions and more fundamentally to misconceive the nature of the trial process. And it is unclear why defendants should not be subject to the same standard, in which case there will be fewer acquittals whenever an affirmative defense is offered. Few "convictions" and "acquittals" works in the context of science, but may not in the context of trials (that depends on whether one thinks the *status quo* is objectionable).

It is also too rigorous a burden to expect the cases of the prosecution and defendant to be more or less hermitically sealed from each other, even if this is limited to whatever "important features" may refer to (and the phrase is quite ambiguous; what is "important" will be intensely idiosyncratic and dependent on what the parties assert). The typical case at trial involves massive overlap of evidence with a few salient disagreements²⁸. The fact finder's task is to decide who or what to believe to resolve those few disagreements, and provide judgment accordingly. Again, were it satisfactory for an acquittal that some of the prosecution's case is compatible with innocence, there would be no convictions, for most of a prosecution's case will always be compatible with innocence. And nothing is "utterly unintelligible" at trial. Evidentiary conflicts can come about because someone is lying to advance his or her interests. There is nothing unintelligible about that. Although I am a great admirer of Prof. Laudan's work, and in particular his forcing us within the law to engage seriously with fundamental conceptual problems, here I think he has not attended to the fundamental differences between the law and most scientific fields.

Jordi Ferrer Beltrán, more implicitly than Laudan under the influence of philosophy of science, proposes a test for proof beyond reasonable doubt that is somewhat analogous to Laudan's:

«According to this standard of proof, to consider a hypothesis as proving guilt, it must meet both of the following conditions:

1. The hypothesis should be able to explain the available information in a coherent way, and predictions about new information that the hypothesis manages to outline must have been confirmed.

²⁶ Popper argued that the progress of science includes making bold predictions and then attempting to falsify them. See POPPER 2002. For one of the empirical tests of the prediction of general relativity, see DYSON et al. 1920.

²⁷ See transcript in ALLEN et al. 2006, 2-75.

²⁸ See, again, ALLEN et al. 2006, 2-75.

2. All other plausible hypotheses which offer an explanation about the same information which are compatible with the defendant's innocence should have been refuted, except for *ad hoc* hypotheses²⁹».

Although the contours of this proposal are less sharply defined than Laudan's, one can see analogous conceptual issues. With regard to the first part of the definition, trials (in the United States at least) do not involve hypotheses that "predict" new information; they involve deciding what happened in light of all the information. This test seems to involve an unhelpful conflating of the legal and scientific contexts; as discussed above, in scientific endeavors, one criterion of a theory's success is its predictions, but that has literally no application to legal fact finding. As to the second part of the definition, it is unclear what it means in two respects. Take again a typical case of witnesses testifying to opposite observations. Obviously one is telling the truth and one is not. If one concludes that the defendant's witness is lying, one has a perfectly good hypothesis of guilt; if one concludes the opposite, then one has a good hypothesis of innocence. The extent to which "information" is compatible with different assertions depends upon how that information is treated by the fact finder. A defendant who testifies to his innocence is "refuted" if the fact finder concludes that he or she is lying.

The second difficulty with this proposal is that the escape hatch that excludes "*ad hoc*" hypotheses seems itself to be entirely *ad hoc*. An example given is the claim that a criminal defendant has been "setup and framed"³⁰. That simply amounts to a claim of innocence and an explanation for the state's evidence. Its plausibility will depend upon everything else in the case. That is true of all claims, whether by the state or the defendant. It is impossible to see why this possible claim of innocence is different from any other. Are alibi's *ad hoc*? Or the claim of the lack of the proper mental state, or insanity? This amounts to a test, contained in the first criterion and the first part of the second, to be applied in some undefined subset when it does not work by claiming any interfering problem is *ad hoc*. If the defendant raises an issue that cannot be refuted for some reason, it can be labeled *ad hoc*, even though it often will be isomorphic to a direct claim of innocence. Perhaps European criminal cases are different from American criminal cases, but this proposal is obviously not an accurate description of what occurs in the United States; nor does it seem normatively attractive.

Michael Pardo and I, building on earlier work of mine on "the relative plausibility theory"³¹, have explored whether the best understanding of burdens of persuasion is that they are an example of inference to the best explanation, using that phrase to refer to cognitive processes rather than as a solution to the question of what is knowledge. The central idea is that cases involve the comparison of alternative stories and the fact finder's choice is over them or driven by them, with the more plausible of the accounts being accepted as true for purposes of the trial. In criminal cases, the prosecution must advance a plausible account of guilt or lose; if the prosecution advances a plausible account, then the defendant must advance a plausible account of innocence or lose³².

This conceptualization is advanced not normatively but positively, and we have tried to show over the years how it is, actually by far, the best account of the actual trial process so far identified. It has the obvious virtue of being consistent with what we know about how fact finders reason, unlike all extant probabilistic accounts as well as Laudan's and Ferrer Beltrán's accounts. It also orders and explains many aspects of the trial process, from various evidentiary rules³³ to virtually all jury instructions on the evidentiary process ("use your common sense,"

²⁹ FERRER BELTRÁN 2006, 19 (ms.).

³⁰ FERRER BELTRÁN 2006, n. 21.

³¹ See, e.g., ALLEN 1994.

³² ALLEN, PARDO 2008.

³³ ALLEN 1991, 373.

“listen to your fellow jurors”, “you do not have to believe all the evidence but try to make sense of it”), except the formal definition of burdens of persuasion to be sure. But as I showed above, the formal definition makes no sense at all understood as a probability measure³⁴ and Laudan and Ferrer Beltrán propose a completely new understanding, and so no other theory of burdens benefits from its ability to explain what the relative plausibility theory cannot.

To be sure, and to be clear, many of the commentators, including Laudan and Ferrer Beltrán, are engaging in normative rather than positive efforts, whereas ours is virtually exclusively positive. We are simply trying to understand what we observe over a relatively narrow observational range. We were not trying to explain, for example, how the trial process fits into larger social processes; we were not even trying to estimate what kind of results obtain from the kind of judicial process we actually observe. We would say that those are empirical questions, for the most part, not analytical ones, and can only be answered empirically. In short, the large questions posed by people like Laudan and Ferrer Beltrán are beyond the scope of our analytical efforts.

Let me now recapitulate the lay of the analytical land concerning burdens of persuasion. The conventional, probabilistic understanding is obviously false in every interesting way; the alternatives that have been advanced are either hopelessly aspirational or very limited in their implications, leaving the larger issues focused on by people like Larry Laudan unaddressed. What could explain this? One possible explanation that I wish to explore to conclude this essay is that it is a consequence of the very method of analysis that is endemic to legal research³⁵. The standard method of legal research is to break problems down into manageable size and analyze them employing the standard tools of modern logic, in particular deduction³⁶. I am a great fan of logical deduction, but its utility has its limits, or perhaps it is being employed in domains that are themselves too capacious for such limited tools. In either event, the standard form of legal analysis is to engage in a logical critique and then to argue for substituting a new and better rule for the critiqued one, much as Laudan, Ferrer Beltrán, have done. Allen and Pardo’s work, while not quite in the same vein, nonetheless dealt with only a very small slice of the relevant universe.

Much of this work makes the implicit assumption that it is engaging with a static environment, and here is where it goes radically wrong, I believe. A more accurate conception of the legal system than a system of static rules is that it is a small part of a huge optimization problem. Consider first the law of evidence, which is comprised of relatively discrete rules of necessary and sufficient conditions, leavened in a number of instances with allocations of discretionary authority to trial judges. These rules are applied to the “trial evidence”, which means the testimony and physical objects proffered at trial, which supposedly provides an exhaustive basis for deducing liability. But this is false. The evidence is literally incomprehensible without rules of language and logic, yet it is simply accepted that a fact finder can process information and deliberate on it. That cannot be done without a vast storehouse of knowledge and the intelligence to use it appropriately. For the law of evidence truly to be regulatory, it must regulate the interaction between what is adduced at trial and the ensuing inferential process that depends upon fact finder’s knowledge and beliefs. It is precisely this gap that generated my example above about the witness testifying.

A derivative of the conceptual point above is also pertinent to an alternative way of understanding Laudan’s proposal. Dr. Laudan in graciously and helpfully commenting on a draft of this article asserted that, notwithstanding the exact wording of his proposal, he intended it as involving the context of application rather than discovery, and that what he had in mind was

³⁴ There are a host of other problems—conjunction effect, computational intractability, and so on.

³⁵ This is the central theme of the Meador Lecture I gave this academic year, ALLEN 2011.

³⁶ Much of Larry Laudan’s work is not so describable; he is attempting to burst conceptual boundaries, in particular his majestic book, LAUDAN 2006. This is not true, however, of his article on burdens of persuasion, *supra*, which neglects some of the lessons of his other work.

something like differential diagnosis in medicine. This moves his proposal significantly in the direction of the relative plausibility theory of Allen and Pardo, as well as undergirding it with inference to the best explanation, which together comprise the best explanation of juridical proof to date. Differential diagnosis, highly akin to qualitative chemical analysis, involves the elimination and inclusion of hypotheses based upon differentiating data points (e.g. if the litmus paper is blue, it's a base; if red, it's an acid). To some extent this is like story formation, but the conceptual gaps involving the nature of evidence and unique context of scientific endeavors noted previously remain. In differential diagnosis or qualitative chemical analysis, just as in the context of discovery (indeed, even more so) the data are clear – the litmus paper really was red or blue. The opposite obtains on the critical variables. One witness testifies the litmus paper was red and another blue. Or one witness testifies it was red and the other side offers evidence or points out circumstances (such as bias or interest) indicating the witness was lying. Or the fact finder simply reaches that conclusion itself based on its observations of demeanor. Trials involve untamable complexity and ambiguity that simply does not exist in standard scientific enterprises, whether in the discovery or application phase. In scientific endeavors, one does not have to gain the assent of some decision maker that is driven by that person's entire life experiences; rather, as previously noted above but equally applicable here, virtually everyone shares knowledge and methodology. Nevertheless, to the extent that differential diagnosis involves the creative articulation of possible explanations, it does indeed bear a relationship to the relative plausibility theory and inference to the best explanation, but it, like Allen & Pardo's work, would still only explain a small part of the relevant conceptual universe.

The challenge of effective legal regulation presses even more deeply. Consider the distinction between primary and litigation behavior. Primary behavior is every day activities, including economic and private behavior (and any other sort). Litigation behavior is behavior dedicated to vindicating legal rights. Resources spent on litigation appear to most legal commentators as dead weight social losses that add nothing of value to society, and thus should be kept to a minimum, yet this could obviously be false. Litigation behavior affects primary behavior and creates incentives for it, just as primary behavior affects litigation behavior and creates incentives for it, as well. For example, perhaps difficulties of litigation create incentives for people to order their primary behavior in ways to avoid litigation, and thus to optimize social productivity. Alternatively, litigation costs could create perverse incentives that overdeter productive primary behavior. The point is that that litigation and primary behavior are parts of huge optimization problems that need to be thought of in precisely that fashion³⁷. This involves thinking of things in system analytic terms rather than the common first order predicate logic or syllogistic terms common to legal research.

I recently addressed this topic in my Meador Lecture:

«[T]he reality of the legal system is that it is not a nice, tidy, simple, and static context, but instead is a bubbling cauldron of messy, complicated, organic, evolutionary processes. The standard tool used to regulate this bubbling mess is rules, and it is the friction between that tool and many of the uses to which it is put that explains in general why fact finding and legal regulation are viewed as so often problematic. This same relationship is explanatory of many legal puzzles, such as, in ascending order of importance, the curious implications of standard legal error analysis, the rules v. standards debate, and the meaning of "law".

The simple concept of a rule as setting necessary or sufficient conditions from which outcomes may be deduced is an example of monotonic logic, in which the addition of postulates or assumptions

³⁷ Larry Laudan begins this process in LAUDAN 2006, and this also motivates some of our joint work.

simply adds to what may be deduced from the previous assumptions. Monotonic logics are powerful tools, as the rise of modern mathematics and the success of many scientific fields demonstrate. They work best when their operant assumptions accurately capture their domains, which means they work quite well, in Hayek's famous dichotomy, in made systems such as games and less well in grown or organic systems, which typifies much of the human condition³⁸. A large part of debate over rules and their limits is often implicitly about the complexity of the relevant domain and one's tolerance for mistakes of different kinds. As the number of pertinent variables increases or when some of them are continuous rather than discrete, the deductive problem quickly becomes computationally intractable, even for computers let alone humans. And of course if a new variable pops up that was not previously anticipated, all deductive bets are off, as it were. In either case (computational intractability or failure of imagination), algorithmic approaches that rely on extant rules generate the standard critiques of the indeterminate nature of rules. In reality, it is not that rules are indeterminate but that they are being put to a task for which they are not optimal³⁹».

I ventured in that lecture to suggest that the central problem of the legal system is similar to the central problem of rationality, which is the taming of complexity. In both cases, simple deductive tools were being put to uses that were suboptimal. That raises the important question what other approaches may be more fruitful. Inspired by a brilliant article by an artificial intelligence researcher, Tim Van Gelder, that I came across many years ago, one possible answer I ventured was that the struggle of rationality to tame complexity may be less like digital computation and more akin to a dynamic regulator, such as the Watt Centrifugal Governor that was a critical part of the industrial revolution⁴⁰. Analogously, legal analysis may need to evolve to deal with the complexities of systems. Van Gelder's example is a metaphor rather than an argument for my purposes, for it provides just the suggestion of possibilities rather than a defined research program, but it is nonetheless interesting.

The growth of the textile industry in England depended upon a consistent energy source with very limited variability. The steam engine provided the energy but its pistons provided episodic bursts of energy rather than a smooth, continuous stream. Fly wheels helpful, but still not adequate. As Van Gelder pointed out, one potential solution to this problem is computational:

Static

1. Measure the speed of the flywheel.
 2. Compare the actual speed against the desired speed.
 3. If there is no discrepancy, return to step 1. Otherwise,
 - a. Measure the current steam pressure;
 - b. Calculate the desired alteration in steam pressure;
 - c. Calculate the necessary throttle valve adjustment.
 4. Make the throttle valve adjustment
- Return to step 1

Tim Van Gelder, WHAT MIGHT COGNITION BE, IF NOT COMPUTATION, *The Journal of Philosophy*, Vol. 92, No. 7 (Jul., 1995), p. 348

³⁸ HAYEK 1973, 35-54.

³⁹ ALLEN 2011, 1060.

⁴⁰ VAN GELDER 1995.

Unfortunately, this computational solution requires a costly person doing it, and it will rarely produce a smooth enough source of energy. James Watt solved this problem by placing movable arms on a spindle at the center of the flywheel, whose motion was transmitted instantaneously to the valve regulating the flow of steam. As the rotation of the fly wheel speeds up, the arms extend, which transmits to the valve and closes it until the proper equilibrium is reached, and vice versa:

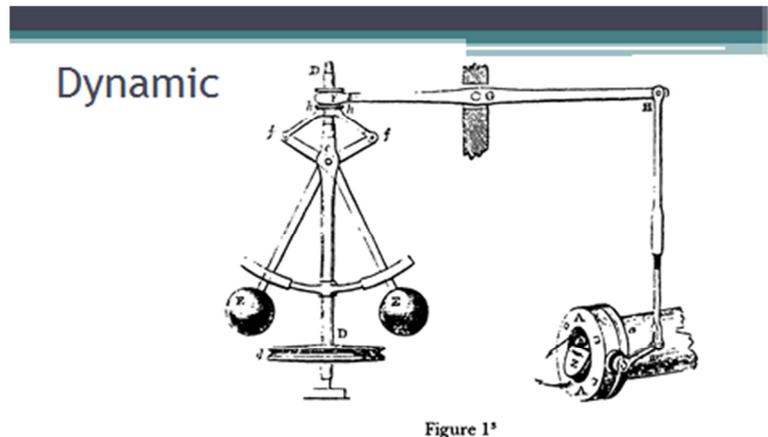


Figure 1³

³ The Watt centrifugal governor for controlling the speed of a steam engine—
from J. Farey, *A Treatise on the Steam Engine: Historical, Practical, and Descriptive*
(London: Longman, Rees, Orme, Brown, and Green, 1827).

Tim Van Gelder, WHAT MIGHT COGNITION BE, IF NOT COMPUTATION, *The Journal of Philosophy*,
Vol. 92, No. 7 (Jul., 1995), p. 349

Regardless whether the centrifugal regulator captures something important about rationality, viewing the legal system with this metaphor in mind may be fruitful. The most dramatic point is that some problems can be solved other than through deductive arguments⁴¹. That is the crucial limitation of the work discussed above, and a consistent constraint on legal scholarship generally⁴². It is undoubtedly useful to break problems down into smaller parts, and so on, but at the same time that process can be counterproductive, disguising rather than highlighting the nature of the entity under examination. The work on burdens of persuasion, including our own, demonstrate that point. The alternative is to think of the legal system more, perhaps, like fluid dynamics treats the flow of liquids and gases, to embrace, in other words, the messiness of real life rather than abstract it away.

Another possibility, which I am presently exploring in my own work, involves the empirical adequacy of a conceptualization of the legal system as an optimization problem involving what is in essence something analogous to a neural network. The conventional conceptualization of the “legal system” remains one largely based on the concept of rules. This is obviously true of most doctrinal areas; indeed, “doctrine” and thus “doctrinal area” largely refer to rules and sets of rules, although their ambiguity and shortcomings are well known. Even the great jurisprudential debate of the last fifty years between Hart, Dworkin, and their respective adherents is largely a debate over rules and their limits that conceptualizes them as decided in a largely hierarchical way involving articulation, application, and review by higher courts. My intuition is that an empirically more adequate conceptualization of the legal system is that it involves an enormous number of decision nodes or loci, as in a neural network, with almost instantaneous communication with untold numbers of other nodes. When, for example, a trial

⁴¹ For a discussion sympathetic to the textual point, see HAACK 2007.

⁴² The rise of empirical research in the American law schools is to some extent a reaction to this problem.

court reaches a decision, it is transmitted to many other people across the country with analogous concerns, and not just to the appellate court that sits atop the trial court. If the case is appealed, again the result is transmitted across a network of interested parties. Even when that particular case is final, other parties can attack it directly in other jurisdictions, or respond to it in an almost infinite variety of ways. The larger the potential disruption of any particular decision, the greater incentive for other “nodes” in the system to respond to it, to attempt to modify, cabin or reject it. Thus rules or applications of rules are disturbances of a system that cause ripple effects across it, leading to reactions until finally some new equilibrium is reached. Thus, the question to ask about a rule or its application is not whether it is “correct”, but whether it is optimal or perhaps even more accurately whether it is satisfactory, where optimality and satisfaction are judged by reference to its disruptive effects on equilibria.

I believe this way of conceptualizing the legal system has enormous explanatory power. It explains, for example, many of the difficulties of burdens of persuasion noted above. They emerge from viewing burdens of persuasion as deductive rules rather than part of a complex system. The question that should be asked is not “what is the burden of persuasion”, but instead what effects do different articulations have.

I think the explanatory power of this conceptualization goes considerably further, as well. For example, it explains why the Dworkin agenda, whether focusing on the legal system or morality, is literally impossible⁴³. Just as no algorithm could predict how a water molecule will actually tumble down the mountain in a mountain stream (although obviously that is a completely determined process), no one could possibly know what the “best” reconstruction of either law or morality is. One can, by contrast, engage in a never ending negotiation over the differing effects of differing articulations of rules (or whatever). Right now, it seems to me that the legal system’s best explanation is precisely a never ending negotiation over those effects, carried on across a huge number of interconnected nodes, in which burdens of proof nudge outcomes in one direction or the other.

⁴³ See, e.g., DWORKIN 1986 and DWORKIN 2011.

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