Law's Treatment of Science: From Idealization to Understanding

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Increasing reliance on scientific evidence in litigation has created a demand for discussions directed at enabling a legitimate interaction between science and law. The article develops the notion of procedural legitimacy—that adherence to legal procedure maintains the legitimacy of the adjudicative system and its outcomes—and applies it to determining how best to admit and use scientific evidence. The problem of undervaluing procedural legitimacy is illustrated through a commentary on contributions to the science and law discussion of Edmond and Roach, and Haack. The author’s thesis is that maintaining adjudicative legitimacy depends on procedural rules being applied as vigilantly to science as to any other evidence. Accordingly, admissibility rules must be properly applied to scientific evidence and, once admitted, the evidence must be scrutinized and weighed against the legal standard of proof. The recommendations for treatment of scientific evidence in the Goudge Inquiry Report are endorsed based on their consistency with the demands of procedural legitimacy.

L’importance accrue donnée aux preuves scientifiques dans les litiges a créé une demande pour des discussions visant à favoriser une interaction légitime entre la science et le droit. L’article prend comme point de départ la légitimité procédurale—la certitude que le respect de la procédure légale préserve la légitimité du système décisionnel et de ses résultats—and l’applique pour déterminer la meilleure façon d’admettre et d’utiliser les preuves scientifiques. Le problème résultant de la sous-évaluation de la légitimité procédurale est illustré par des commentaires sur les contributions de la science et du droit de MM. Edmond et Mme Roach, et Haack. L’auteure avance la thèse que pour préserver la légitimité décisionnelle, les règles procédurales doivent être appliquées aussi rigoureusement aux preuves scientifiques qu’aux preuves de toute autre nature. Par conséquent, les règles d’admissibilité doivent être appliquées de façon appropriée aux preuves scientifiques et, une fois admis, les éléments de preuve doivent être examinés et évalués selon la norme légale de preuve. L’article appuie les recommandations concernant le traitement des preuves scientifiques dans le rapport de la commission d’enquête Goudge, étant donné qu’elles satisfont aux exigences de la légitimité procédurale.

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Introduction
The temptation to borrow legitimacy from science is hard to resist. When science is understood as a passionate though objective inquiry into truth, it is hard to imagine a more desirable conclusion than the one reached scientifically. Scientific conclusions have an air of legitimacy that other fields of inquiry can not help but envy, and law is no exception. The discussions surrounding science and law, both in case law and commentaries, contain the sentiment that consistency with science enhances the legitimacy of adjudicative decisions. Certainly, it is desirable to avoid legal decisions that are blatantly contrary to scientific knowledge. It is problematic, however, to idealize science as a source of legitimacy such that the internal legitimacy of the legal process is itself overlooked. When that occurs, the stage is set for the legal process’s own legitimacy to be threatened.

I suggest that both law’s legitimacy and science’s legitimacy are found in their adherence to their respective procedural rules: an inquiry
can be legitimately “scientific” when it follows certain scientific rules and procedures, even if the conclusion arrived at is later disproven. Similarly, following procedural rules maintains the legitimacy of adjudicative decisions, even if some substantive wrong occurs. For instance, if a plaintiff is wronged by a defendant, but the evidence properly presented at trial does not suggest that the defendant is more likely liable than not, then his case will be dismissed. In that situation, the plaintiff’s rights were not vindicated (i.e., a substantive wrong occurs), but the integrity of the legal process is unaffected as long as appropriate procedures were followed in hearing the plaintiff’s case.

Caught up in an idealization of science, however, judges and commentators have been led to suggest changes to legal procedures in an effort to better accommodate science, without considering whether their suggested solutions compromise law’s own legitimacy. In light of this concern, and in an effort to move away from idealization towards a better understanding, I will elucidate the similarity between law and science that I have suggested: both accept that they operate in conditions of uncertainty, despite which, both scientific and legal outcomes maintain legitimacy through adherence to procedure. I refer to this concept in this paper as “procedural legitimacy.”

A consideration of procedural legitimacy leads to an appreciation of a significant difference between science and law: while science seeks empirical reality, law seeks to establish legal facts as defined by substantive law, which then culminate in a legal determination. Failure to appreciate the different enterprises of science and law, along with a nonappreciation that adherence to legal procedure maintains the legitimacy of adjudicative decisions, results in a susceptibility to prefer science as a better truth-seeking enterprise than law, causing an inappropriate idealization and deference to science. In an effort to illustrate that susceptibility, I will demonstrate how it has influenced the commentaries of Susan Haack1 and the joint commentary of Edmond and Roach,2 both of which have made provocative contributions to the science and law discussion.


After providing a critique of these commentaries on the basis that they improperly underappreciate procedural legitimacy in law, I will apply the concept of procedural legitimacy to the science and law interaction. My application will draw from the recommendations in the Goudge Inquiry into Pediatric Forensic Pathology,\(^3\) as my impression is that it presents a balanced and principled assessment of the science and law interaction, resulting in useful recommendations regarding the court’s use of science.

My discussion begins with a brief account of the major developments in Canadian case law in respect of the science and law interaction. The preliminary section is intended to summarize the case law that will assist in appreciating the upcoming discussion, and is also itself illustrative of the idealization of science implicit in judicial comments.

1. **Highlights from Canadian case law**

The science and law discussion is generally situated in the rules surrounding admissibility of expert evidence. Sopinka J. in *R v Mohan*\(^4\) set out the current test for admissibility of expert evidence in Canada. Under the *Mohan* analysis, experts are permitted to state opinions as an exception to the rule disallowing admissibility of opinion evidence. To fall within the exception, the expert’s testimony must fulfill four criteria. First, the subject of the expert’s opinion must be relevant. Relevance includes logical relevance, meaning the evidence must tend to prove a fact at issue. Relevance additionally includes legal relevance—the probative value of the expert’s opinion must outweigh any prejudicial impact it may have. Second, along with relevance, the expert’s testimony must be necessary to the trier of fact (i.e., outside of the scope of a layman’s knowledge). Third, the expert must be qualified to give the opinions offered. Fourth, if no other exclusionary rule is applicable to exclude the expert’s evidence, then the opinion is admissible.

Along with setting out the test for admissibility of scientific evidence generally, Sopinka J. cautions of the danger of misuse of expert evidence in *Mohan*: “Dressed up in scientific language which the jury does not easily understand and submitted through a witness of impressive antecedents,”\(^5\) it could distort the fact-finding process as juries would naturally give excessive weight to such evidence. In other words: triers of fact are susceptible to idealize scientific-looking evidence and fail to evaluate it appropriately, resulting in fact-finding distortion. Anticipating


\(^4\) [1994] 2 SCR 9 [*Mohan*].

\(^5\) *Ibid* at 19.
this distortion to the fact-finding process, Sopinka J. further comments that a novel scientific technique should be subjected to “special scrutiny to determine whether it meets a basic threshold of reliability.” Despite the fact that there is no mention of reliability in Sopinka’s articulation of the test for admissibility of expert evidence, his cautionary comments relating to threshold reliability set the stage for reliability becoming increasingly important in the science and law discussion in Canada.

The Supreme Court had an opportunity to comment on admissibility of scientific evidence in its 2000 decision in *R v J LJ.* While *Mohan* had left the landmark American decision *Daubert* unmentioned, the Supreme Court interpreted *Mohan* in *J LJ* as having rendered the Canadian approach parallel to the *Daubert* analysis of “reliable foundation.” In *Daubert,* Blackmun J. had called on trial judges to use scientific constructs to determine whether scientific evidence was scientifically reliable, and therefore, admissible. The questions that the trial judge was to ask were: (1) Has the technique or theory been tested—i.e., subjected to the scientific concept of falsification? (2) Has the theory or technique been published or peer reviewed? (3) Does the scientific technique have a known or potential rate of error? (4) Is the theory or technique generally accepted in the relevant scientific community? This marked the beginning of using scientific criteria to address legal reliability.

While the Court in *J LJ* was careful to indicate that its intention was not to change the *Mohan* analysis, the two approaches were amalgamated in a 2007 decision of the Alberta Court of Queen’s Bench. This amalgamation was not intended to represent a strict test to be invariably applied, but it provides a useful synopsis of the considerations that could be relevant to admissibility of expert evidence, representing the *Mohan* analysis, supplemented by *J LJ:*

Criterion I. Relevance to an issue

A. Does the evidence meet the threshold of logical relevance?
B. Does the evidence meet the threshold of reliability?
   a. Is the opinion based on novel science?
   b. Does the opinion evidence pertain to the ultimate issue?
   c. Does the novel science attain threshold reliability?

[Daubert factors]

6. Ibid at 28.
7. [2000] 2 SCR 600 at 28, 33 [*J LJ*].
i. Has the theory/technique been tested?
ii. Has the theory or technique been subject to peer review/published?
iii. Is there a known or potential error rate?
iv. Is the theory/technique generally accepted?

C. Do the costs of admitting the evidence outweigh the benefits?

Criterion II. Necessary to assist the trier of fact.

A. Is the subject matter of the expert opinion beyond that of the trier of fact?

Criterion III. Absence of any exclusionary rule

Criterion IV. Properly qualified expert.

If Mohan and the subsequent cases are taken to mean that the reliability analysis need only be undertaken for novel scientific evidence, then the R v Trochym decision is an expansion of the reliability principle: in Trochym, the Supreme Court recognized the fluidity of science. Translated into a comment on admissibility, a technique or theory that may have once been admissible may later be inadmissible, because of the fluid and evolving nature of science.

In Trochym, a threshold reliability analysis resulted in exclusion of evidence that was extracted through hypnosis technique. Trochym added that along with novel scientific evidence, a reliability evaluation should take place where reliability is unclear or has been challenged. The majority of the Supreme Court upheld the inadmissibility ruling of the post-hypnotic evidence despite the concerns expressed by the dissenting judges that hypnosis evidence was in fact well established; it had already been scrutinized by the courts and had been admitted before. It could be suggested, therefore, that the legal value for precedent had been trumped by the requirement to establish scientific validity and, considering the evolving nature of science, this seems appropriate.

The development of Canadian case law illustrates the sentiment that science is both probative and prejudicial. The prejudicial impact was first articulated in Mohan, wherein Sopinka J. suggested that notable credentials along with scientific language impress triers of fact. So, instead of evaluating evidence, triers of fact may simply side with one scientific expert or another, diluting the fact-finding process to a battle of experts. This problem is augmented when evidence cloaked as science finds its way into the trial process. The credentials of the expert, coupled with

12. [2007] 1 SCR 239 [Trochym].
13. Ibid at 31.
language “dressed up” with scientific terms, can cause lay triers of fact to give too much weight to such evidence, erroneously thinking that it is indeed “scientific.” The concerns surrounding the prejudicial impact of science can thus be summed up as the fear of the idealization of science—if triers of fact assume that evidence is “scientific,” they are susceptible to being disproportionately swayed by that evidence.

In order to curtail the prejudicial impact, trial judges have been called on to act as vigilant gatekeepers—it is the trial judge’s job to prevent distorting evidence from reaching the trial process. In order to do so, judges have been asked to apply scientific criteria to evidence at the admissibility stage and assess whether evidence is scientifically reliable or not. If the evidence passes the scientifically reliable test, then it is admissible. If not, then the evidence should be prevented from entering the trial process. But while the prejudicial effect of science is thought to arise from triers of fact being susceptible to idealizing science and deferring unduly to scientific evidence, the gatekeeping solution provided similarly displays an idealization of science by incorporating scientific constructs into legal reasoning, suggesting that scientific reliability brings legitimacy to evidence.

Clearly, the legal system has not escaped the idealization of science. In an effort to minimize idealization in order to move towards a more apposite understanding of how the two fields ought to interact, in the next section I show that science and law share an important similarity—legitimacy through procedure.

II. Procedural legitimacy in science and law

In this section I demonstrate that although both law and science must value accuracy in their respective enterprises, both fields operate in conditions of uncertainty. Both fields internally accept their conditions of uncertainty, and despite the uncertainty, both are able to produce legitimate outcomes through adherence to procedure. And although the two fields share this feature of procedural legitimacy, they are quite different in their ultimate inquiries.

1. Procedural legitimacy in science: legitimate outcomes despite uncertainty

Most generally, science is understood as an inquiry aimed at determining empirical truth. Surely, however, it cannot be said that anyone seeking to discover an empirical reality, by that desire alone, conducts science. For an inquiry to be scientific, and thus distinct from other forms of inquiry, it must have distinctive characteristics so that it can be legitimately understood as “scientific.” The scientific method, “consisting in systematic
observation, measurement, and experiment, and the formulation, testing, and modification of hypotheses, can be considered the distinctive feature that makes a scientist's inquiry scientific and distinguishes it from other forms of inquiry. This definition of the scientific method arises out of a concept called "falsification" which constitutes the conventional concept of how science does and ought to progress. Falsification is, therefore, sometimes referred to as the philosophy of science. The concept of falsification demonstrates the uncertainty inherent in scientific inquiry. It is most useful to demonstrate this by describing why the original concept that induction was the method of scientific progress gave way to falsification.

Prior to falsification, the popular theory for conducting scientific inquiry was based on Newton's concept of induction. Induction can be summarized as making generalizations based on observations alone. But induction has to be based on observable phenomena—without something observable, there is no way to induct a conclusion. That would mean that science could not deal with phenomena that are beyond observation—like the atom, or the surface of the moon, before the technology advanced enough to make these observable.

Challenging the view that induction could be termed the scientific method, Karl Popper popularized the concept of falsification. This method of reasoning provides for indirect evidence and logic to allow for non-observable phenomena to be scientifically tested. Essentially, falsification allows for unobservable events to be tested based on predictions that can be observed. A scientist's theory thus takes this shape: if he is right in his explanation of phenomenon X, then he should observe Y, Y being the observable prediction. If he does not observe Y, then the theory is falsified. If he does observe Y, then his conclusion must be that his theory is not falsified, but he cannot conclude that the theory is proven.

Inherent in the concept of falsification, therefore, is ongoing uncertainty. The presumption is that a theory cannot be proven (it can only be falsified). Current scientific philosophy (i.e., that science does and

15. The Oxford English Dictionary, online: <http://www.oed.com>, sub verbo "scientific method."
16. My central purpose in this section is to illustrate that procedure has a significant role in legitimizing inquiries as scientific, even in the face of uncertain outcomes, in accordance with the most prominent philosophical account of science—Popper’s theory of falsification (see note 18). However, I acknowledge that there are differing philosophical models of science and scientific progress, particularly those based on historical and sociological perspectives. See, for instance, Thomas Kuhn, The Structure of Scientific Revolution (Chicago: University of Chicago Press, 1970), or Paul Feyerabend, Against Method: An Outline of an Anarchist Theory of Knowledge (London: NLB, 1978).
should progress through falsification) recognizes, therefore, that despite being an inquiry into the truth, there is no way to guarantee that the truth has been found. How is it that an inquiry into truth can still be legitimate, justifiable and progressive, despite its inherent recognition that truth is always elusive? The answer lies in scientists adhering to the rules and procedures that are born of falsification, or the philosophy of scientific progress.

The philosophy of falsification as the appropriate method of scientific inquiry gave rise to the particular methodologies that are currently taught and generally accepted in the scientific community as the scientific method\(^9\): the methodology of testing hypotheses.\(^{20}\) Testing hypotheses involves four essential elements: observation, development of hypothesis, making logical predictions, and using experiments to test the hypothesis. The experiments used to test the hypothesis must be conducted in a reproducible manner—there must be experimental controls that make the observations used to test the hypothesis reliable and repeatable.\(^{21}\) Once the data is obtained from the experiment, it should be analyzed and interpreted, leading to a conclusion whereby a new hypothesis can be formulated.\(^{22}\) Once concluded, the results should be published, and the repeatability of the results should be tested.

Adherence to the scientific method, including the validity of experimental designs, is internally governed through peer review.\(^{23}\) A scientist’s peers evaluate whether appropriate methodology was followed while conducting a scientific study. Peer review, Ziman suggests, keeps science “reasonably honest and factually reliable...but it does not pretend to eliminate error, nor does it guarantee certainty or truth.”\(^{24}\) What this means is that uncertainty is accepted in the scientific community, but the

\(^{19}\) I do not claim any expertise over scientific method and falsification. For the purpose of this paper, the simplified understanding of the scientific method that I present will suffice. For a more detailed account, see generally, Popper, \textit{supra} note 18.


\(^{21}\) Kosso, \textit{supra} note 17 at 14-20.

\(^{22}\) \textit{Ibid}.

\(^{23}\) \textit{Ibid}.

\(^{24}\) \textit{Ibid}.
work of scientists is, nonetheless, legitimately scientific if it follows the current accepted methodologies, or rules of procedure.\textsuperscript{25}

Thus, when Susan Haack suggests that there is no scientific method \textit{that guarantees success}, her conclusion is defensible. But the suggestion that while science has a "'free-ranging,' 'just do it' improving character" compared to law, which is "highly regimented, conducted under formal rules of procedure," draws an unfitting distinction between science and law.\textsuperscript{26} Scientific validity can be thought of as depending on following a method consisting of rules and procedures in a similar way that law does. In the next section, I will demonstrate how the legal process too maintains legitimate outcomes despite conditions of uncertainty by adhering to valid legal procedures.

2. \textit{Procedural legitimacy in law: legitimate outcomes despite uncertainty}

Adjudicative decision-making occurs through a process of fact-finding, so accurate fact-finding is important to the legal process. As Stein puts it: "accuracy in fact-finding is a logical prerequisite to proper administration of the controlling substantive law."\textsuperscript{27} If adjudicative decision-makers were consistently inaccurate in their fact-finding, their subsequent application of substantive laws would be based on inaccuracies, making protection of substantive rights impossible. Since protection of substantive rights must be an aim of the trial process, promoting accuracy in fact-finding must also be fundamental to that process. But accuracy is not always possible, considering the need for timely dispute resolution, economic constraints, and numerous sources of error that exist within the adjudicative process.

\textsuperscript{25} As stated in note 16, there are differing perspectives on science that suggest that scientific method is not universally applied, and Popper's theory of falsification may be an incomplete and, therefore, idealized interpretation of science, because it ignores the social and political influences that impact scientific progress. I recognize the utility of a more nuanced understanding of science generally; however, my purpose herein is to illustrate the concept of procedural legitimacy that can be demonstrable in the context of science, even in its idealized form. My purpose is not to engage in the debate between science as a representation of natural reality and science as a social and political construct. For useful commentaries that do so engage, see Sheila Jasenoff, \textit{Science at the Bar} (Cambridge, MA: Twentieth Century Fund, 1995); Gary Edmond, "Judicial Representations of Scientific Evidence" (2000) 63 Mod L Rev 216; and David Caudill & Lewis LaRue, \textit{No Magic Wand: The Idealization of Science in the Law} (Lanham, MD: Rowman & Littlefield, 2006).

\textsuperscript{26} Haack, "Irreconcilable Differences," \textit{supra} note 1 at 8, 14. In support of her contention that science is not methodologically bound, Haack relies on the comments of Paul Feyerabend, \textit{Against Method: An Outline of an Anarchist Theory of Knowledge} (London: NLB, 1978). Feyerabend's comments represent a critique of the more conventional notion of scientific method. Though provocative, his comments do not represent the most prevailing current view, which is my focus.

Consequently, although it is undoubtedly important to strive for accuracy, fact-finding occurs in circumstances of uncertainty.\(^\text{28}\) Fact-finding (and the resulting adjudicative decision) is based on whatever evidence is presented at trial. As such, the uncertainty that is present in the legal process manifests as evidentiary gaps. These gaps result in potential inaccuracy in fact-finding. Evidentiary gaps have a number of sources.\(^\text{29}\)

First, there is the practical issue that a crime or a civil claim arises from an event that occurred in the past, so it is not possible to simply observe an event and determine what happened.\(^\text{30}\) The event has to be reconstructed from fragments of available evidence. Moreover, admissibility rules sometimes restrict what might otherwise be useful evidence in order to protect some other legal principle. For instance, incriminating evidence that is obtained through an improper search or seizure is constitutionally inadmissible,\(^\text{31}\) even if the evidence obtained from the improper search would reduce the factual uncertainty surrounding the truth of the crime. Similarly, evidence subject to privilege is not admissible. Therefore, facts must be found without that evidence, though the inadmissible evidence might make the fact-finding more accurate. In short, the legal system accepts the inevitability of evidentiary gaps—sometimes it even causes them.

The legal system's acceptance of the uncertainty that results from evidentiary gaps is self-evident when considering the burdens of proof required to establish each element of a substantive right or a crime. In civil cases, an event is considered a legal fact if it is more likely to have occurred than not occurred. That means that in civil cases, a chance of inaccuracy of up to forty-nine per cent is accepted. That is, there is up to a forty-nine per cent chance that an event found as a legal fact is not a "fact" in reality. In the criminal context, elements of crimes have to be established "beyond a reasonable doubt." For the sake of illustration, assume that this means the standard of proof is ninety-five per cent. If the trier of fact concludes that

\(^{28}\) Ibid at 2.

\(^{29}\) Larry Laudan, *Truth, Error and Criminal Law: An Essay in Legal Epistemology* (Cambridge: Cambridge University Press, 2006) at 16. In the discussion to follow, I refer to Laudan in respect of his description of the adjudicative process, which I found illuminating and helpful. However, my supposition of procedural legitimacy is contrary to Laudan's ultimate purpose, which is premised on the truth-seeking function of a trial and ultimately seeks to minimize adjudicative inconsistencies with factual reality, or truth.

\(^{30}\) Recall the discussion above wherein induction, or ascertaining conclusions based on observation alone, was not possible for science either.

she is anywhere from zero to ninety-four per cent sure that the accused committed the crime, then she has to acquit the accused, even though there could be quite a high likelihood that the accused did commit the crime. Why is it that the legal system and all those governed by it accept this risk of inaccuracy? How does the adjudicative process maintain its legitimacy despite this sort of potential discrepancy between legal fact-finding and actual fact?

One way to answer these questions is to accept that uncertainty in fact-finding is simply unavoidable, and the burdens of proof represent a fair allocation of the risk that erroneous fact-finding occurs. Stein explains that the inevitable uncertainty in adjudicative fact-finding necessitates facts to be found on the basis of probabilities. Because fact-finding is based on probabilities as opposed to certainty, there is a risk that an act or event that is found as a fact for legal purposes is not a fact in reality. The legal system, therefore, must choose how to fairly allocate the chance of fact-finding errors occurring. Laudan has described this as the "distribution of error." The distribution of error is most clearly understood by considering the burdens of proof as representing what law-makers have determined to be a fair distribution of error.

Assume again that the burden of proof in the criminal context is ninety-five per cent, the prosecution has to show that the accused is ninety-five per cent likely to be guilty. This means that if there is an error, it is much more likely to fall on the side of not-guilty than guilty, because if an accused is found guilty, there should only be a five per cent chance that the accused is actually innocent. It is much more likely that the accused is erroneously found to be not-guilty than erroneously found to be guilty. The risk of error is therefore distributed largely in favour of the accused. Society will bear the greater risk of errors, because law-makers have decided that wrongful convictions are to be more strenuously avoided than false acquittals. Based on the same principle, in civil cases setting the burden of proof at fifty-one per cent (for the sake of illustration) means that if an error (i.e., a legal fact is found that does not correspond to what really happened) is to occur, it is slightly more likely to occur in favour of the defendant. If there is to be an error, it is slightly more likely that the error will disadvantage the plaintiff, as law-makers have decided that the accuser should bear slightly more of the risk of erroneous fact-finding.

32. Laudan, supra note 29.
33. Stein, supra note 27 at 2.
34. Ibid.
35. Laudan, supra note 29 at 123.
So far, the discussion in this part can be summarized thus: there is uncertainty in adjudicative fact-finding; uncertainty means that there is a risk of error; this risk ought to be fairly allocated among litigants. This seems to be an accurate description of how the legal system handles its conditions of uncertainty. This description is incomplete, however, because it suggests that conditions of uncertainty result in the legal system being inevitably flawed and that fair allocation of risk is the band-aid covering the errors that will inevitably result. I suggest, however, that when adjudicative decisions are made based on legal facts that do not correspond with actual reality, such decisions are not necessarily illegitimate. Adjudicative decisions made based on inaccurate fact-finding are nonetheless legitimate legal decisions if they adhere to procedural rules, much in the same way as scientific outcomes can be legitimately scientific even if they do not represent the factual reality.

The legal process implicitly recognizes that adjudicative outcomes that do not correspond with factual reality can still be legitimate. Although the proposition may seem distasteful, it becomes more palatable by acknowledging that the standards of proof, which anticipate uncertainty in fact-finding, are part of the substantive element of laws. What has to be proven and to what extent it has to be proven for the purposes of adjudicative decision-making are defined in the substantive law. For instance, substantive law dictates that to convict an accused of assault, the accused's intention to assault, along with the assault itself, must be proven beyond a reasonable doubt. In the civil context, to grant a remedy for an action in negligence, the substantive law dictates that existence of a duty of care, breach of standard of care, causation (including lack of remoteness), and harm must all be proven on a balance of probabilities—"more likely than not."

When the evidence establishes the elements of the substantive law to the relevant standard of proof, these elements become legal facts—they are understood to be proven, and are accepted as facts in the legal context. The law is then enforced (a conviction or acquittal is entered, a remedy is allowed or disallowed) based on the legal facts that have been established through the evidence, and how the evidence measures up to the standard of proof. Fact-finding is thus a process dedicated to finding legal facts for the purpose of vindicating legal rights and enforcing laws. The substantive elements of the law—including the standard of proof—define those rights and laws.

Consequently, an adjudicative decision is legitimate when the fact-finder makes a decision based on the evidence that is properly before her at trial and appropriately measures that evidence to the relevant standard of
Whether the adjudicative decision corresponds with factual reality does not itself compromise the legitimacy of the resulting adjudicative decision. Of course, a legal decision can be illegitimate or improper. If there were some procedural problem with what evidence was relied on and how it was construed, then the adjudicative outcome would not be valid. For instance, if a jury relied on evidence that it should not have, or if they misunderstood the standard of proof and did not measure the evidence against it appropriately, then the resulting decision is not valid. This remains the case whether or not the legal facts that gave rise to the decision correspond with factual reality.

In the context of the science and law discussion, this means that admissibility of evidence rules must be appropriately applied so that the evidence that is presented to the jury is properly put before them. If the admissibility rules are not applied properly, it means that the trier of fact is not measuring appropriate evidence to the relevant standard of proof, and the legitimacy of the resultant adjudicative decision is questionable. For instance, consider a jury that relies on evidence that is improperly cloaked as scientific evidence (i.e., assume that the evidence is more prejudicial than probative, and never should have been put before the jury if the admissibility rules had been properly applied). The jury relies on the prejudicial evidence, and becomes convinced that the accused is guilty beyond a reasonable doubt. On that basis, the jury convicts the accused. This adjudicative decision’s legitimacy is compromised, whether or not that accused really did commit the crime. If the accused did really commit the crime, then the jury would have come to a conclusion that corresponds with what really happened, but its decision is nonetheless invalid because procedural rules were compromised—the jury relied on improper evidence. The legitimacy of adjudicative outcomes is not dependent on consistency with actual reality. The adjudicative process, premised by the substantive law that it is to uphold, seeks to establish only that part of factual reality that is defined by substantive law—the elements of the crime or civil law, to be established to the relevant standard of proof. The legitimacy of the resultant legal determination is dependent on whether the appropriate procedures were adhered to during the decision-making process.

3. Application to the science and law interaction
The above discussion was intended to demonstrate that while both science and law value accuracy, both operate in circumstances of inevitable

36. Ibid at 13.
37. Ibid.
uncertainty but are, nonetheless, able to produce valid results through subscribing to proper procedures.

Although the foregoing exercise was designed to present the similarity that law and science share, it has illuminated a difference between science and law that provides a compelling reason why law ought to be very careful when seeking legitimacy for itself in science: science and law seek to establish different things.

Ultimately, science seeks to arrive at some empirical truth. The procedures that arose out of the philosophy of falsification are aimed entirely at coming closer and closer to empirical reality (though recognizing that certain proof is elusive). The rules and procedures of the scientific method are relevant to that goal. Law’s rules and procedures are relevant to adjudicative decision-making, which is premised on substantive laws that define what legal facts need to be established and to what extent they have to be established. In the legal world, “legal facts” are defined as something different from empirical reality; there is a significant difference between the empirical truth that science is ultimately concerned with, and legal fact, which is what the legal process is aimed at establishing. Considering this difference, law is considerably more accepting of uncertainty than science—the acceptance of uncertainty is inherent in the legal definition of “fact.” But this difference between science and law does not compromise law’s legitimacy. It just means that science and law seek different things.

Without appropriately defining the difference between what science seeks versus what law seeks it is very easy to idealize science on the basis that it is clearly more dedicated to empirical truth than law. It is necessary to take careful note of this distinction, because idealizing science in this way, compared to law, can cause a blind desire for law to be consistent with science. This desire is not inherently inappropriate, but coupled with an underappreciation of procedural legitimacy can cause legal procedures to be unjustifiably compromised in an effort to seek legitimacy in consistency with science.

I suggest that Susan Haack’s general suggestion that reforms to the adversarial process ought to be considered in order for the legal system to accommodate science better is derived from the notion that science is a more legitimate inquiry into truth compared to law, and underemphasizes the legitimacy of legal inquiry. Further, I suggest that Edmond and Roach’s contribution (albeit substantively very different from Haack’s) contains a similar combination of a preference for empirical inquiry and an underemphasis of procedural legitimacy in law. This allows Edmond and Roach to impose a fairly strict application of scientific/empirical constructs onto legal decision-making at the admissibility of evidence.
stage. Moreover, it enables them to offer an asymmetrical approach to expert evidence in criminal trials by imposing more strenuous procedural rules, which effectively alter the prosecutorial burden of proof. In the next section, I will elaborate these claims.

III. The commentaries of Haack, Edmond and Roach

1. Susan Haack

[The core of my argument will be that there are deep tensions between the goals and values of the scientific enterprise and the culture of the law... between the investigative character of science and the adversarial culture of our legal system... 38]

In developing her argument that the tense relationship between science and the litigation process is a result of the “deep tensions between the goals and values of the scientific enterprise and the culture of law,” 39 Susan Haack provides the insight that it is useful to consider the fundamental nature of both science and law in order to appreciate the interaction between the two fields. Presumably, a fundamental appreciation of both fields would reveal the most foundational reason for the tension between them, and thereby illuminate how best to resolve the tense interaction between science and law. With a hint of pessimism, Haack suggests that if there is to be any solution at all, some alteration to adversarial procedure could be useful in easing the science and law tension. 40

I suggest, however, that Haack’s project is compromised, because, due to an underemphasis on the internal legitimacy of the adjudicative system, her illustration of the fundamental nature of law is incomplete. Haack’s description of law reflects an undervaluing of the legitimacy that law maintains through its procedures: consistent and appropriate application of legal procedure provides legitimacy to adjudicative decision-making, despite the reality of uncertainty and the corresponding potential that legal facts do not equate to actual fact. While Haack appreciates that legal inquiry is restricted by rules of evidence, as well as time and cost considerations (all of which can contribute to the circumstances of uncertainty), 41 she does not duly recognize the important role of legal procedure in preserving the legitimacy of legal decisions. Consequently, Haack’s analysis is somewhat unappreciative of law, leading to an imbalanced presentation of science

39. Ibid at 2.
40. Ibid at 22, and Haack, “Truth and Justice,” supra note 1 at 156-158.
and law. The imbalance leads to adversarialism and adversarial procedure being displayed as the root cause of the tension between science and law.

Haack starts by describing science as being in the core business of inquiry into truth. Being a field of inquiry, Haack describes the "core values of science [as] epistemological: honesty, with oneself and others, about what the evidence is and what it shows." On the other hand, she describes the legal system as a dispute resolution mechanism wherein "a trial aims not to find out whether the defendant is guilty or liable, but to arrive at a determination of the defendant's guilt or liability—'determine,' here, probably being closer to 'deem' than to 'discover.'" This characterization of a trial is consistent with my conception that the aim of a trial is to arrive at legal facts and come to legal determinations of guilt or liability based on those facts. The problem is that Haack does not acknowledge the validity or legitimacy of this goal of a trial. Instead, her discussion makes science seem valuable and esteemed compared to law, on the basis that science and scientists, at a fundamental level at least, are inquiring into truth in a way that law is not. And although the focus of her work is not necessarily to provide a solution to the science and law tension, but to critically illustrate it, her description, displaying a relative deference to science, eventually leads her to endorse solutions that reduce the adversarial impact on scientific evidence and thereby modify adversarial processes when science is involved.

Despite acknowledging that the trial process is concerned with coming to legal determinations (which, as I have argued above, can be legitimate despite potential inconsistency with factual reality), Haack maintains that factual truth is essential to justice and, therefore, to the legal system as the administrator of justice. She suggests that likely nobody needs reminding that "substantive justice requires factual truth." And to determine these factual truths, Haack suggests, law increasingly seeks the assistance of science. I agree that factual accuracy is desirable in the legal process. Still, legal decisions are made in conditions of uncertainty. Consequently, legal facts are to be proven on the basis of the applicable standard of proof, as opposed to a standard of truth itself. This contemplates the potential that legal facts do not equate with truth itself. So, while I may agree that "substantive" justice requires factual truth, the legal system, given its conditions of uncertainty that make guaranteeing factual truth

42. Ibid at 7.
43. Ibid at 9.
44. Ibid at 12.
46. Ibid, and Haack, "Irreconcilable Differences," supra note 1 at 1.
elusive, is validated through procedural legitimacy. I suggest, therefore, that procedural legitimacy, being less dependent on factual accuracy, must be considered a necessary counterpart to the substantive justice that the legal system endeavours (but cannot guarantee) to uphold.

A recognition of this more nuanced nature of the legal process and its legitimacy would have led to the perception that the “facts” that are necessary to arrive at legal determinations are legitimately different from the empirical truths that science seeks. Moreover, the inquiry into those legal facts (i.e., the trial process) is also legitimate, but Haack’s further contrast between law and science does not account for this.

As part of her effort to illustrate the differences between science and law, Haack compares the role of the lawyer (as advocate) to the role of a scientist (as inquirer). The difference between advocacy and inquiry, she suggests, is that the advocate must present the evidence in the light that is most favourable to her client, and persuade the judge that she has the best evidence. On the other hand, the scientist’s role is to consider all the evidence and “assess it as fairly as possible.” Making a similar argument in “Truth and Justice,” Haack provides that while lawyers try to make a case by presenting evidence persuasively, scientists seek out all available evidence and assess it impartially. She suggests that even when scientists compete with one another, their ultimate purpose remains to discover the truth. Consequently, she makes the somewhat condemnatory comment that a scientist’s competition is “very different” from an attorney’s competition to win a case.

Haack’s contrasting of the role of lawyers and the role of scientists to distinguish between law and science has two problems. First, while the lawyer and the scientist may treat evidence differently in the way she describes, Haack’s description of the scientist’s use of evidence seems quite similar to the role judges play in the legal process—disinterested in either party, their role is to evaluate whatever evidence was appropriately presented in the trial process and to come to an unbiased conclusion based on that evidence. Comparing lawyers to scientists makes science look unprejudiced and law comparatively biased, while another analogy is equally available. Haack’s comparison of the role of scientists to lawyers simply illustrates that law’s inquiry is adversarial while scientific inquiry is not (or at least it is not as noticeably adversarial as adjudicative inquiry).

49. Ibid at 152.
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Second, through her suggestion that even when scientists are competitive they are still in the business of truth seeking, while lawyers' competition is motivated by a desire to win a case, Haack portrays scientists as benevolent and lawyers as partisan. By contrasting lawyers' competition with scientific competition, Haack suggests that while scientists remain ever committed to searching for truth, lawyers are impliedly committed to something less valuable than that. This position seems unfairly critical of lawyers' role as advocates, especially because the legitimacy of scientists having different commitments than lawyers is unmentioned; indeed, lawyers are not on a quest for empirical reality in the way that scientists are, because the lawyer's purpose is to establish legal facts—and that is a legitimate purpose.

Along with her comparison of scientists to lawyers, Haack comments on the different time constraints that are relevant to both fields. She suggests that while the legal system requires prompt and final resolutions, science is openly fallible, a continuing progression—science simply takes the time it takes.⁵⁰ Undeniably, adjudicative decisions are constrained by time in a way that science may not be, but Haack concludes that this difference between the two fields causes law to be overly demanding on science (because law needs answers immediately, but the relevant science could still be provisional). Adversarialism is again presented to be the root of the tension between science and law: adversarialism (and the resultant desire to win) convinces lawyers to get scientists as witnesses to assert scientific authority for science that is still provisional. While overly zealous advocacy may be a generalized problem of litigation, surely scientists who are willing to assert scientific authority for provisional science must be implicated as part of the problem.

Arguing that law's adversarial culture is at the root of the science and law tension, Haack concludes that the adversarial process should tolerate some adaptation to its procedures in order to accommodate science better.⁵¹ Somewhat optimistically, she comments that legal culture has adapted its process to accommodate the impact of adversarialism by an (albeit modest) increased use of court-appointed experts. Critics of increased use of court-appointed experts, Haack explains, suggest that this is a move towards the inquisitorial system. While (understandably) declining to get deeply involved in a comparison of inquisitorial legal processes versus the adversarial, she suggests that arguments that express

⁵⁰ Haack, "Entangled," supra note 1 at 256.
⁵¹ Haack, "Irreconcilable Differences," supra note 1 at 22, and Haack, "Truth and Justice," supra note 1 at 156.
a fear of the adversarial process becoming "inquisitorial" are essentially melodramatic.\textsuperscript{52}

Haack additionally presents the view of some authors that the adversarial process is the fairest way to proceed where both parties have an equal opportunity to present the evidence of their choosing.\textsuperscript{53} She counters this criticism with a materialistic argument: there are often economic barriers in the adversarial process that would allow one party to call endless experts, but another party to be hard pressed to call even one.\textsuperscript{54} This, she suggests, would be difficult to call "fair." I agree. Economic imbalances pose a problem for the adversarial process generally, but this concern ought to be dealt with directly, not indirectly by altering the adversarial process when it comes to scientific experts.

Summing up, Haack's presentation of the fundamental nature of science and law consistently displays science as better than law. Next to the image of science as a truth-seeking, impartial exercise, law is made to look particularly flawed, even unethical. The adversarial process, however, is defined almost exclusively by implication by comparing it to an image of science as a fundamentally unbiased, progressive inquiry into truth, but without exploring the nature of the legal process and its own legitimacy.

Haack compares science and law without mentioning that the internal legitimacy of the legal process is premised on the law's internal definition of legal facts and proof. Thereby, Haack engages in a comparison akin to comparing apples to oranges on the criteria of which tastes more like apples—of course the apple will appear better, and the orange will look quite inadequate, but that conclusion results from a faulty comparison. The comparison engendered a deferential tone towards science and a critical tone towards law, culminating in the conclusion that adversarialism is the problem, so to promote a better interaction between science and law, changes to adversarial procedure should be tolerated. This conclusion undervalues the significance of consistent adherence to legal procedure to maintain the legitimacy of adjudicative outcomes.

My intention in this critique was to demonstrate the impact and implications of underemphasizing the concept of procedural legitimacy and its underpinnings when considering the science and law interaction. I suggest that Edmond and Roach display a similar underemphasis, although somewhat more subtly, which I hope to illustrate further in the next section.

\textsuperscript{52} Haack, "Truth and Justice," supra note 1 at 156-157.
\textsuperscript{53} Ibid at 157.
\textsuperscript{54} Ibid.
2. Edmond and Roach: a contextual approach to the admissibility of the state's forensic science and medical evidence

It is the importance we ascribe to the presumption of innocence, to avoiding the conviction of the innocent, the premium placed on fairness and accuracy, the difficulty of challenging incriminating expert evidence in the context of the accusatorial criminal trial, along with the very real limitations of supposed trial safeguards (e.g. warnings to juries), that encourage us to recommend the imposition of fairly onerous standards in the determination of whether the state’s forensic scientists (and other experts) should be entitled to express incriminating opinion in the criminal proceedings.

Edmond and Roach’s contextual approach to admissibility of scientific evidence in the criminal context leads them to suggest an innovative alteration to admissibility determinations: asymmetrical admissibility of evidence rules between the state and the defence. Under their approach, where the state seeks to tender incriminating expert evidence, its admissibility would be subject to a “demonstrable reliability” standard, while defence expert evidence would be subject to a lesser standard.

Edmond and Roach suggest that their approach to admissibility moves away from “invoking philosophically driven, idealized models of science,” and is instead shaped by legal principles and criminal justice values. The authors define these values as “the presumption of innocence, the need for the state to prove guilt beyond a reasonable doubt, and the goal of preventing the conviction of the innocent.” Based on these principles, Edmond and Roach suggest that an accused person should not be confronted by unreliable or speculative expert opinion evidence. In order for criminal procedures to be fair, therefore, the actual reliability of incriminating expert opinion, scientific or otherwise, is fundamental. Consequently, under Edmond and Roach’s framework, all incriminating expert evidence must be demonstrably reliable to be admissible.

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56. Ibid at 403.
57. Ibid, generally. The demonstrable reliability approach to prosecutorial evidence was originally developed in Gary Edmond, Pathological Science? Demonstrable Reliability and Expert Forensic Pathology Evidence (Toronto: Government of Ontario, 2007), prepared as a research paper for the Goudge Inquiry [Pathological Science].
58. Ibid at 345-346.
59. Ibid at 345.
60. Ibid at 387: “A right not to be confronted with unreliable or speculative expert-opinion evidence would seem to embody the state’s obligation to prove guilt beyond a reasonable doubt, demonstrate commitment to fairness...”
61. Ibid at 345 and 406, for example.
The justification for the asymmetrical approach comes from pointing to two categories of inequities in the criminal trial context: (1) lack of scientific literacy among lawyers and judges and (2) economic imbalances that result in the state having much better access to experts than defendants. To establish the lack of scientific literacy, Edmond and Roach recount empirical studies that suggest that lawyers and judges are unable to appreciate frailties in scientific evidence. As a consequence of this incapacity “[t]he traditional tools of the adversarial process (cross-examination, opposing experts, instructions to juries)” are inadequate to protect against the distorting effects of misleading experts.62

The authors point to economic disparity to account for why “[t]he defense is typically an unarmed adversary that lacks expert assistance.”63 Resource disparities result in the state having substantially better access to forensic sciences than defendants. It is, therefore, more difficult for defence counsel to obtain experts to counter the readily available experts of the state, leaving state expert witnesses largely untested. Consequently, not only is there no expert presenting a different view than the state expert, defence counsel also do not have the benefit of an expert who can assist them in preparing their cross-examination. Such untested evidence is then presented to the judge, who is far from an expert herself, and has only been presented with one side of the “expert story.” The economic and resource imbalances between the state and defence thus compromise the fairness of the adversarial process, because, augmented by lack of scientific literacy among legal players, the result is inadequate protection of the accused person from being confronted with potentially improper evidence. Edmond and Roach suggest that creating an asymmetry in the admissibility onuses is a justifiable way to account for the practical inequities that exist in the criminal trial process.64 This has the flavour of a “two wrongs make a right” argument: the first “wrong” is the inequity disfavouring the defence in criminal trials. Purporting to equalize this by asymmetrizing admissibility criteria, making the state’s expert evidence subject to a more onerous standard is the second wrong, stemming from

62. Ibid at 366.
63. Ibid at 362.
64. The differential approach is also discussed in Pathological Science, supra note 57 at 32: “This paper contends that the highest admissibility standards for expert evidence should be applied to evidence adduced by the prosecution in criminal proceedings. Frequently, the defence will not be in a position to conduct testing, determine error rates, or publish the results of studies. The defence does not maintain its own experts or investigative institutions and laboratories. It does not routinely sponsor social, scientific or biomedical research. In consequence, the defence should not be burdened with the same admissibility standards imposed upon the prosecution.”
an undervaluing of consistency in procedure as a requirement of achieving legitimate adjudicative outcomes, as I will explain below.

Having suggested that the admissibility criteria should be asymmetric, Edmond and Roach discuss the nature of the burden that should be placed on Crown expert evidence. The authors comment that Crown "expert evidence ought to be excluded on the grounds of unreliability or unknown probative value," and conclude that it should be subject to a "demonstrable reliability" standard at the admissibility stage. The authors suggest that the Daubert factors, being "focused on indicia of reliability," would be useful in applying the legal standard of demonstrable reliability. Among the Daubert criteria, the testing criterion, which would require the expert evidence to have undergone some empirical assessment, is considered the most important.

Although they suggest that the Daubert criteria are helpful in determining demonstrable reliability, Edmond and Roach do not subscribe to the Daubert court’s notion that the Daubert criteria are indicative of scientific reliability, nor its idealized image of science or scientific reliability. Discussing science as a type of evidence, the relevant concern is not scientific reliability, but actual reliability. Consistent with their express commitment that some concept of "scientific-ness," should not be relevant to determining admissibility, Edmond and Roach maintain that they do not argue for "strict application of Daubert to all proffers of expert evidence nor derogation from those criteria according to 'non-science' and 'experience-based' classification. Rather, [they] are advocating greater attention to evidence of reliability in every case of incriminating expert opinion."

A number of elements from Edmond and Roach’s route are agreeable. They fairly point out that “[i]n many ways, the questions of whether

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65. Edmond & Roach, supra note 2 at 392.
66. See also, Pathological Science, supra note 57 at 31. There, Edmond suggests that state evidence be subject to a “Mohan Plus" criteria—i.e., the Mohan criteria plus demonstrable reliability must be established for Crown evidence to be admissible.
67. Edmond & Roach, supra note 2 at 400.
68. Ibid. In Pathological Science, supra note 57 at 36, Edmond similarly suggests that the Daubert criteria, and especially testing, are useful tools to approach legal reliability.
69. Edmond & Roach, supra note 2 at 396; and at 399: “We suggest that the Daubert criteria do not embody the essence of all authentic scientific inquiry.”
70. As Edmond puts it in Pathological Science, supra note 57 at 40: “The invocation of scientific method doctrines and casting of empirical investigations as formal attempts at disproof should not become prerequisites to determinations of legal reliability. Instead, questions of admissibility and reliability should be focused on the more fundamental and legally significant question of whether the expert evidence is demonstrably reliable.”
71. Ibid at 404.
Daubert embodies the essentials of genuine science and whether we can develop useful means of demarcating science from other types of knowledge and experience are distractions.\textsuperscript{72} I agree. They are distractions because the relevant concern is not whether evidence is "scientific" or not, so determining if the Daubert criteria appropriately characterize science is non-essential. Moreover, as Edmond and Roach imply, expert evidence should be treated consistently in the legal process whether the evidence can be labelled scientific or not. That is, "non-science" or "experience-based" expert evidence ought to be legally reliable just as scientific expert evidence should. This is not to say that the legal reliability of all evidence can be determined in the same way, but that it should be subject to a consistent standard of reliability. This is consistent with my project of avoiding an idealization of science that would result in scientific evidence being treated differently than other types of evidence, on the basis (erroneous or not) that it is understood to be science, and that constructs typical of scientific inquiry, as set out in Daubert must not be applied strictly to all types of evidence, as this would constitute an imposition of scientific or science-like reasoning on legal determinations.

However, the special relevance that Edmond and Roach give to empirical testing to establish demonstrable reliability may be a risky preference for empirical reasoning. This has a perilous potential because it may cause an inadvertent usurping of legal reasoning which does not have an empirical design in the way that science does.\textsuperscript{73} This potential is demonstrable by considering Edmond and Roach’s proposed treatment of the sociological evidence tendered in the \textit{R v Abbey} decision.

The trial judge in Abbey had excluded a sociologist’s evidence related to the potential meanings of a teardrop tattoo. The Court of Appeal overturned the trial judge’s attempt to impose Daubert-style admissibility criteria on the expert’s opinion: “sociologists don’t employ the scientific method, and they don’t purport to.”\textsuperscript{75} The Court of Appeal in Abbey thus presented a flexible approach to be applied to admissibility of evidence that is not typically considered scientific.

Edmond and Roach, however, suggest that the sociological evidence was not demonstrably reliable, so it would have been inadmissible under their framework. They agree that the sociologist’s expertise was properly established, that it was appropriate for him to speak to the significance

\textsuperscript{72} Edmond & Roach, \textit{supra} note 2 at 399.
\textsuperscript{73} See Part II (3).
\textsuperscript{74} 2009 ONCA 624 [Abbey].
\textsuperscript{75} Ibid at 108.
of teardrop tattoos among North American gangs generally, and that his evidence was "to some extent, even empirically predicated." But they were concerned that his evidence lacked demonstrable reliability, because the extrapolation from North American gangs generally to Abbey’s gang specifically did not have empirical support.

At the Court of Appeal, the concern that the expert’s opinion was generally relevant to North American gangs was addressed by limiting the scope of the sociologist’s evidence. He was not permitted to testify that the teardrop meant that the accused had murdered an opposing gang member, but he could testify as to what teardrop tattoos tended to mean among North American gangs. Edmond and Roach, however, consider this a second-best solution, suggesting instead that without empirical support for the extrapolation from general to specific, the evidence ought to be entirely excluded. I interpret this as an excessively stringent approach to admissibility that would have the effect of improperly preventing evidence that is probative and otherwise admissible from reaching the trier of fact, premised on an ardent commitment to empirical reasoning.

Undoubtedly, the legal system is not foundationally concerned with whether there is a trend that a teardrop tattoo might mean a murder was committed. Rather, the legal system is concerned with whether there is a reasonable doubt that the accused committed a crime. Surely, evidence indicative of a general tendency can be probative and relevant to making that legal determination, but Edmond and Roach’s approach would require that the link between the sociologist’s evidence and its applicability to the specific issue at trial must be empirically established before the trier of fact can even have access to the evidence. This approach problematically equates probative value with an empirical demonstration of the relevance of the evidence.

Consequently, Edmond and Roach’s framework would prevent probative evidence from entering the trial process, where arguments can be advanced to convince the trier of fact of how much weight ought to be accorded to the evidence of a general tendency. If evidence that meets the requisite threshold of reliability (and that satisfies the rest of the Mohan criteria) is not admitted on the ground that probative value is essentially equated to an empirical demonstration of relevance, then the procedural rules of admissibility are compromised, and the legitimacy of the resultant adjudicative decision becomes questionable. The approach taken by the

76. Edmond & Roach, supra note 2 at 392.
77. Ibid at 392-393.
78. Ibid.
Court of Appeal in *Abbey* (which drew from the recommendations of the Goudge Inquiry, discussed later) is preferable, because it would allow probative evidence, properly limited in scope, to be considered by triers of fact, who are then able to come to a legitimate legal determination based on all the evidence properly presented to them, as well as the argument relating to weight that should be given to the evidence.

For Edmond and Roach, however, demonstrable reliability (underpinned largely by empirical reliability), although an onerous standard, makes Crown evidence more legitimate. The more onerous standard, they suggest, is a method of providing protection to the accused, which is compromised due to practical inequities. The imposition of the demonstrable reliability criteria on Crown evidence is, in a sense, an attempt to restore some legitimacy to the criminal trial process. Edmond and Roach appeal to criminal justice values as a justification for their approach.

Edmond and Roach define criminal justice values exclusively in terms of protection for the accused. Though the values suggested (prevention of improper conviction, presumption of innocence, and requirement of proof beyond a reasonable doubt) are essential, there are other values that must also be essential to the criminal justice process, like protection of society, prevention of false acquittals, or deterrence of crime. The authors’ presentation of criminal justice values is imbalanced and, since criminal justice values are the grounding of their position, their solution also reflects a similar asymmetry.

Committed to the protection of the accused, the authors concentrate on how detrimental the trial process is to the accused, causing them to underemphasize that the burden of proof enormously favours the accused. The authors do not consider the impact of their proposed asymmetrical evidentiary standard on the burden of proof. This is a particularly problematic oversight, because the burden of proof (itself a representation of criminal justice values) is part of the substantive criminal law that dictates what standard of proof the evidence must attain in order for an element of an offence to be legally proven. It represents what lawmakers have decided is the appropriate distribution of error, as described above. These authors do not consider that their position undermines the substantive burden of proof by making it more difficult to meet by amending the admissibility of evidence rules. As Laudan has persuasively argued, using evidence rules to make it more difficult to show guilt is an
unprincipled use of evidence law, because the burden of proof is already established by the relevant substantive law.79

As explained above, legitimate adjudicative decisions result when evidence is appropriately presented to the trier of fact, who then evaluates the evidence in relation to the appropriate burden of proof, as defined by law-makers. Presentation of evidence is governed by admissibility rules, so appropriate application of admissibility rules is essential to maintaining legitimate adjudicative decisions. I suggest that altering the procedural admissibility rules through which evidence is presented to the trier of fact is an unjustifiable compromise to legal procedure. The authors overlook this essential principle because of their (creditable) overemphasis on protection of the accused and their desire to prevent factually inaccurate convictions. Of course, wrongful convictions are extremely undesirable. That is why law-makers established the standard of proof for criminal conviction as proof beyond a reasonable doubt rather than something closer to the civil standard of a balance of probabilities.

To sum up, the inspiration for Edmond and Roach’s approach is the creditable goal of preventing factually incorrect convictions. Applied to the science and law discussion, the authors suggest that inequities in the criminal trial process that are detrimental to the accused can be legitimized by imposing asymmetrical admissibility criteria for expert evidence that favours the accused. While defence expert evidence may be subject to some lesser standard, the Crown’s incriminating expert evidence would be subject to a demonstrable reliability standard. Demonstrable reliability is largely informed by empirical testing, typically associated with scientific inquiry. As such, I suggest that these authors make use of science-like constructs to reintroduce legitimacy into the trial process. By suggesting a more strict admissibility criteria for Crown evidence, the authors attempt to interfere with the rules governing admissibility of evidence by making it harder for the Crown to meet its burden of proof.

Understandably, because Edmond and Roach take note of inequities that disadvantage the accused in the criminal trial process, they become compelled to somehow advantage the accused in order to restore equity. While the goal is understandable, attempting to achieve that goal by introducing adaptations to admissibility rules that would effectively make the prosecution’s standard of proof more difficult to attain, does not seem suitable. There are a number of other solutions that may be more direct methods of facilitating better protection of the accused. Most drastically, better protection of the accused could be achieved by advocating for an

79. Laudan, supra note 29 at 124.
increase in the standard of proof required to convict an accused person in order to increase the protection of the accused. This approach, though seemingly extreme, would be less detrimental to the legitimacy of the legal process compared to changing procedural rules with a design to change the substantive burden of proof. Besides this approach, directly addressing the economic and resource imbalances that Edmond and Roach point to, and which Haack alluded to as well, warrants increased consideration.80

I have suggested that Susan Haack’s approach reflects a commitment to factual accuracy and a deference to science as a better inquiry into factual accuracy than law. Edmond and Roach’s approach, I suggest, has demonstrated an overcommitment to empirical legitimacy. I do not intend to suggest that the utility of scientific evidence in determining legal facts, the protection of the accused and ensuring reliance on reliable evidence are improper commitments. Moreover, I do not suggest that accurate fact-finding is wholly unimportant to law—clearly, the burdens of proof require some degree of certainty. Accuracy in fact-finding is important because fact-finding is the basis of adjudicative decisions that protect substantive rights and enforce substantive laws.

What is problematic, however, is an underemphasis on procedural legitimacy, or the notion that consistent adherence to legal procedure is essential to maintaining legitimate adjudicative outcomes. Procedural legitimacy acknowledges that adjudicative outcomes are made in conditions of factual uncertainty, so it is inevitable that from time to time, a legal fact will not correspond with factual reality, and an adjudicative outcome will be inconsistent with what really happened in fact. Given these circumstances, adherence to legal procedure ensures legitimate adjudicative outcomes. Considering the significance of consistent adherence to legal procedure, an underemphasis on procedural legitimacy in preference for substantive concerns can result in inappropriate procedural compromise.

Therefore, I suggest that the effort to obtain the best benefits of scientific or other expert evidence must be undertaken with the understanding that consistent application of legal procedure is significant in maintaining the legitimacy of the adjudicative system generally, as well as the legitimacy of individual legal outcomes. As I will demonstrate in the next part, the recommendations in the Goudge Inquiry can be endorsed on this basis:

80 Susan Haack and Edmond & Roach point to economic and resource disparities that compromise the utility and fairness of the trial process, particularly the usefulness of cross-examination. Surely where one party is not appropriately resourced, the adversarial process is imbalanced. I have suggested that this imbalance should not be addressed by tampering with legal procedures or procedural rules. It should be tackled—not only in the science and law context, but in the broader context of access to justice, though it is beyond the scope of this paper to do so.
the utility of science to the adjudicative process is appreciated, but it is not recommended that the legal process display any submissiveness to it.

IV. Procedural legitimacy applied to the science and law interaction
The principle that the legal system maintains legitimacy through adherence to procedure must be kept in mind when considering how science and law interact. If procedural rules (which includes rules of admissibility of evidence) are distorted in order to accommodate science, then law’s own source of legitimacy can be compromised. As such, while it is tempting to look to science as a source of legitimacy for adjudicative decisions, overreliance upon and overdeference to science or scientific constructs can be detrimental to the legal process. Of course, this is not to say that science is wholly nonuseful to the legal process. Without a doubt, scientific evidence can be relevant, probative, and necessary. Along with its benefits, however, science also has a potential prejudicial impact, as articulated in Mohan and subsequent decisions. Bearing in mind the principle of legitimacy via procedure in the legal process and the benefit and potential prejudice that science can have, how ought the legal system to accept and use scientific contribution without drifting into any self-compromise?

The Goudge Inquiry Report is a useful guide to utilizing science appropriately in the courtroom without compromising the integrity of the legal process. The recommendations provided in the Report are a balanced recognition of the probative but also prejudicial impact of scientific evidence. In the upcoming section, I endorse the recommendations on the basis of their consistency with the principle of procedural legitimacy.

The Goudge Inquiry was convened to investigate the wrongful convictions that occurred in relation to suspicious deaths of children in Ontario. Noting that forensic pathologist Dr. Charles Smith had provided expert testimony in many of the cases that were found to contain miscarriages of justice, the Goudge Inquiry Report includes a chapter devoted to “how the legal system can regulate the behavior of expert witnesses and, in particular, the vital gatekeeping role of trial judges.”

The Goudge Inquiry highlighted two major areas that judges ought to be particularly mindful of while gatekeeping at the admissibility stage. First, judges are called on to clearly and precisely define the scope of the witnesses’ expertise, and to police the boundaries of the expertise during the expert’s testimony. Second, judges must assess threshold reliability for all expert evidence at the admissibility stage. Carefully considering

81. Goudge Inquiry, supra note 3 at 471.
82. Ibid, generally, and see specifically 471-475.
83. Ibid, generally, and see specifically 477-480.
the scope of expertise as well as undertaking threshold reliability analyses are squarely grounded in the Mohan construct for admissibility of expert evidence. Thus, rather than compromising the pre-existing admissibility rules, Goudge J.A.'s recommendations serve to enhance the application of these rules, as I will further explain below.

1. **Defining scope of expertise at the admissibility stage**

Justice Goudge's study revealed that on numerous occasions, Dr. Smith had been permitted to give opinions well beyond the scope of his expertise, prompting the recommendation that scope of expertise should be carefully scrutinized and defined at the admissibility stage, and diligently policed thereafter. This recommendation is entirely consistent with the four-part Mohan analysis. When experts give opinions beyond their expertise, they violate the qualification requirement, as well as the general exclusionary rule prohibiting lay witnesses from tendering opinion evidence. Moreover, if experts testify beyond their scope of expertise, the testimony becomes particularly prejudicial because the unqualified opinion could be given excessive weight due to the erroneous assumption of expertise. As Sopinka J. apprehensively commented in Mohan, "impressive antecedents" can improperly sway juries—it is all the more prejudicial when the impressive antecedents do not relate to the opinion tendered.

Entertaining an alternative solution, Justice Goudge considers the appropriateness of relying on instructions to the jury to give less weight to evidence that is beyond the scope of the witness’s expertise. Noting that it is very difficult for juries to "tune out" evidence they heard at trial when coming to their decision, Justice Goudge concludes that front-end gatekeeping in respect of scope of expertise is more desirable than relying on jury charges after the fact. Not only is this a justifiable conclusion; it is necessary, based on the principle of procedural legitimacy.

An expert who tenders an opinion beyond the scope of their expertise constitutes a lay witness who tenders opinion evidence. The result is a violation of the Mohan criteria for admissibility of expert testimony and of the general rule that opinion evidence is inadmissible. Neither the Mohan analysis nor the general rule of exclusion of opinion evidence require that the trier of fact give less weight to opinion evidence; they require that opinion evidence does not come before the trier of fact at all (i.e., lay opinions are inadmissible evidence). If evidence that violates admissibility rules is

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84. Ibid.
85. Ibid at 474. In noting the jury’s difficulty in tuning out evidence heard at trial, Goudge J refers to the comments of Professor Erica Beecher-Monas and Professor Gary Edmond, both of whom expressed this sentiment during the course of the inquiry.
admitted, the validity of the resulting adjudicative decision is questionable due to a procedural impropriety, whether or not juries are later instructed to give less weight to the evidence. Consequently, an adjudicative decision that is based on the testimony of an expert that was given beyond their scope of expertise could be invalid because such evidence should never have been presented to the jury. Front-end gatekeeping in respect of scope of expertise is a sound and useful recommendation.

Justice Goudge's conclusion that scope of expertise, being an issue of admissibility, requires vigilant front-end gate-keeping bears in mind the potential for prejudice that science brings with it (i.e., the potential for distorting fact-finding due to presentation by distinguished experts). It is also consistent with procedural legitimacy—failing to define scope of expertise at the admissibility stage would violate the Mohan analysis for admissibility of expert evidence, as well as the general rule prohibiting admission of the opinion evidence of lay witnesses.

2. Determining threshold reliability: avoiding idealization of science
Calling on judges to assess the threshold reliability of expert evidence at the admissibility stage, Justice Goudge demonstrates that such an approach is implied throughout the Mohan analysis. Threshold reliability is relevant to weighing probative value against prejudicial effect of evidence, as unreliable evidence is less probative and more prejudicial. Thus, balancing probative value against prejudicial effect is required when determining whether evidence has legal relevance under the Mohan analysis. Similarly, if the prejudicial effect of evidence outweighs its probative value, the evidence can be excluded for that reason alone, as this is a stand alone exclusionary rule. As such, determining threshold reliability is relevant to whether "any other exclusionary rule applies." Third, threshold reliability is relevant to the necessity requirement, as evidence that does not meet a threshold level of reliability cannot be said to be of assistance to the trier of fact.

Justice Goudge thus demonstrates that threshold reliability is an essential component of the Mohan analysis. That being the case, the existing admissibility rules are not compromised by his urging that judges assess threshold reliability carefully when determining admissibility of evidence. Instead, this recommendation enhances the application of the Mohan analysis because it serves as a reminder that threshold reliability is relevant at the various stages of admissibility analysis. The Goudge Report
provides a number of related recommendations designed to assist judges with determining threshold reliability. These recommendations too serve to make the Mohan analysis more employable, and pertinent to scientific evidence.

Commenting on what tools judges might use to assist them in determining threshold reliability, Justice Goudge endorses the view that the Daubert factors can have the beneficial effect of ensuring that expert evidence adheres to a "scientific method that emphasizes testing and peer review and that is conscious of known or potential error rates, as a means of attempting to ensure the reliability of expert evidence." However, he is careful to acknowledge that many types of expert evidence may not be amenable to empirical analysis: "Testing and error rates are optimal, but it is important to reiterate that many kinds of expert opinion are not readily susceptible to empirical testing or reproducibility. The inability to provide testing results does not necessarily render these kinds of expert evidence unreliable." These comments suggest that while scientific constructs (which the Daubert factors embody) may be useful, they should not be overapplied. Justice Goudge is consistent that in making threshold admissibility determinations, science can be appreciated without overreliance on it.

Along with his general comments on the Daubert criteria, Justice Goudge provides a list of factors relevant to determining threshold reliability. The list recommends considering the scientific reliability of a theory or technique that an expert opinion is grounded on. Questions to ask in this respect include: "whether [the scientific theory or technique] is generally accepted; whether there are meaningful peer review, professional standards, and quality assurance processes; and whether the expert can relate his or her particular opinion in the case to a theory or technique that has been or can be tested, including substitutes for testing that are tailored to the particular discipline." Similar to his general comments relating to the Daubert criteria, these factors demonstrate Justice Goudge's appreciation that scientific reliability can be a relevant consideration in determining threshold reliability, but that scientific constructs may not be applicable to all evidence, and should not be applied without discerning whether the evidence is amenable to scientific testing.

The Goudge recommendations thus allow for the use of scientific constructs within the legal determination of threshold reliability, but refrain

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88. Ibid at 481.
89. Ibid at 492.
90. Ibid at 495.
from idealizing scientific constructs such that they replace the legal concept of threshold reliability. As such, while the utility of scientific reliability is not wholly ignored, law’s own procedural rules are uncompromised. This commitment to the legal system’s procedures is additionally apparent in the reminder that the trial judge’s role is to determine threshold reliability—the trial judge does not need to be convinced of the ultimate reliability of the evidence at the admissibility stage.91

3. **Threshold vs ultimate reliability: maintaining procedural legitimacy**

Justice Goudge’s additional factors for consideration reflect his cognizance of the important distinction between threshold reliability and ultimate reliability. This is because they take into account the second stage of evidentiary analysis where the trier of fact assigns weight to evidence, and considers the ultimate reliability of the evidence:92:

- whether there is a serious dispute or uncertainty about the science and, if so, whether the trier of fact will be reliably informed about the existence of that uncertainty
  ...
- whether experts can express the opinion in a manner such that the trier of fact will be able to reach an independent opinion as to the reliability of the expert opinion. [emphasis added]

These factors contain the implicit recognition that at the admissibility stage, trial judges should examine the admissibility of evidence, bearing in mind that the trier of fact is yet to assign weight to the evidence; in other words, the evidentiary analysis is not over at the admissibility stage. Rather than determining admissibility entirely on the basis of reliability, Justice Goudge suggests that judges consider whether the trier of fact will be able to appropriately weigh the evidence when determining admissibility. What this recognizes is that considerations at the admissibility stage are designed to ensure that the trier of fact receives appropriate evidence, which can then be weighed against the relevant burden of proof and a substantive decision arrived at in accordance with adversarial procedure.

Evidence that attains a threshold level of reliability should be presented to the trier of fact, who will then determine ultimate reliability when the evidence is weighed prior to making a substantive decision. As such, it would be inappropriate for the trial judge to make a judgment about the ultimate reliability of evidence at the admissibility stage, because that ignores the fact that evidence that attains threshold reliability (along with

92. *Ibid at 495.*
satisfying the other Mohan criteria) is appropriate for the trier of fact to receive, weigh and use in order to make the substantive decision. While it is appropriate for the trial judge to consider whether the trier of fact will be informed of uncertainties in evidence, the trial judge does not have to solve these uncertainties herself. In accordance with a proper application of admissibility rules, that task must be left to the trier of fact at the weighing of evidence stage.

In that light, it would be inappropriate for the trial judge to have to be convinced of the scientific reliability of the evidence at the admissibility stage, because such a standard exceeds the threshold reliability determination. Scientific reliability and scientific constructs may become more strenuously applicable at trial, as counsel attempts to convince juries of the amount of weight to accord to scientific evidence. Still, even when ultimate reliability is being assessed, scientific reasoning must not usurp legal reasoning. As discussed above, law and science seek to establish different things, and their respective procedures facilitate the achievement of those different goals. A strict reliance on scientific constructs to answer legal questions is an inappropriate utilization of science in the legal process.93

In an effort to avoid overreliance on scientific constructs to make legal determinations in cases where significant scientific evidence is tendered, jury charges could include a reminder to them of the difference between the scientific and legal proofs. Justice Goudge endorses the use of model jury charges published by the Canadian Judicial Council “in cases where expert evidence is important.” He suggests as well that where appropriate, judges could provide “structured questions to assist the jury in determining ultimate reliability,” similar to the questions that the trial judge would have asked at the admissibility stage. The recommendations further provide that judges should remind jurors to use their common sense to decide whether to accept all, some or any of an expert’s testimony.94 I generally agree with these suggestions; however, asking jurors to use common sense may not be enough of a safeguard to prevent their overreliance on scientific constructs. Juries must not idealize science, either by way of being overly deferential to scientific experts, or by equating scientific fact with legal fact. In respect of the latter, jury charges ought to make clear that applying the evidence presented at trial to the relevant burden of proof proves a legal “fact,” and arriving at a legal “fact” is not a scientific inquiry, and does not require scientific proof.

93. See Part III (2).
94. Goudge Inquiry, supra note 3 at 511-513.
4. **Utility of adversarial process**

Drawing a distinction between threshold and ultimate reliability contains the implicit acknowledgement that evidence that meets a threshold level of reliability is yet to undergo the scrutiny of the adversarial procedure, where ultimate reliability can be more fully explored. This reflects Justice Goudge's assurance that the adversarial process is a legitimate and useful one for determining ultimate reliability, and this is a welcome sentiment compared to the tone of dissatisfaction towards the adversarial procedure expressed by Haack and Edmond and Roach.

Justice Goudge's commitment to the utility of the adversarial process is more expressly evident in his discussion of the role of court-appointed or joint experts, which has been recommended from time to time. The Goudge Inquiry does not recommend these solutions, suggesting instead that “one of the benefits of an adversarial system is its ability, through properly resourced and informed cross-examination and presentation of evidence, to best reveal and illuminate areas of scientific controversy.” He recommends, therefore, the effective use of the adversarial system, rather than painting it as the flaw that causes science to get distorted when the two fields interact. And, in an effort to maintain and enhance the utility of the adversarial process, Justice Goudge recommends that a trial judge ought to ensure that existing disclosure provisions are complied with so that the adversarial process can operate ideally, “ensuring that all parties are fully prepared and informed, and, as a result, can effectively test the expert testimony presented.”

5. **Recommendation regarding education**

Cognizant of the heavy burden that his recommendations place on trial judges, both in defining the scope of an expert's testimony and determining threshold reliability, Goudge J. acknowledges that their continued education is vital to his recommendations being successful. I would add to this that if cross-examination is to be understood as a useful means of illuminating scientific controversy, then lawyers' continued education is necessary as well. Experts being questioned by lawyers who have a limited understanding of the expert's field may distort the evidence due to

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95. *Ibid* at 506.
96. *Ibid* at 508.
97. In order to play their role of vigilant gate-keeper role, Goudge J recommends that while judges cannot be expected to resolve scientific controversies, they can “learn to understand what constitutes good and bad science...and the frailties and limits of science.” He recommends the National Judicial Institute to consider developing additional programs for judicial education on scientific reliability and scientific method, and for the Canadian Judicial Council to prepare a Canadian equivalent to the *Reference Manual on Scientific Evidence* that exists in the United States.
the lawyer's ignorance of that expert's field, coupled with their aptitude for cross-examination tactics.

It may also be desirable for judges' and the bar's continuing education to bring to their attention their susceptibility to overdeference to science. As I have tried to point out, if science is seen as something ideal, and law as something less than that, then it is only natural to look to science to bring legitimacy to adjudicative fact-finding and decision-making. Looking to science for legitimacy can cause legal players to be overly demanding on science, and seek answers that science is not able to provide, and this can contribute to the distorting impact that science can have on fact-finding. Looking to science in this way can cause unprincipled and unnecessary overreliance on science to legitimize adjudicative decisions—the same type of overreliance that Sopinka J. feared would prejudice the fact-finding process.

6. Overview
Justice Goudge's recommendations account for the potential prejudice of scientific evidence by calling on judges to scrutinize the qualifications of experts and determine the threshold reliability of expert evidence at the admissibility stage. Both recommendations are grounded in the Mohan admissibility analysis for expert evidence, so the recommendations do not alter the pre-existing admissibility rules. Instead, judges are called on to do cogently what the Mohan admissibility analysis requires of them, particularly in the case of scientific evidence, where the potential for prejudicial impact may be amplified. Far from altering the procedural rules governing admissibility, the Goudge Inquiry's recommendations ensure that admissibility rules are being appropriately applied, and the triers of fact are being provided with appropriate evidence. This is essential to obtaining procedurally sound, valid adjudicative decisions.

The distinction between threshold and ultimate reliability is important for judges to keep in mind in order to appropriately apply procedural admissibility rules. Although admissibility rules can generally be understood as exclusionary rules, they can be interpreted as rules designed to ensure that juries are permitted to hear evidence that they ought to hear. If evidence is too strenuously screened at the admissibility stage (i.e., a judge seeks ultimate reliability or scientific reliability of evidence before allowing evidence into the trial process), then the trier of fact will not have the opportunity to consider evidence that ought to be considered, and the adjudicative decision could thereby be invalid. Thus, as Goudge J. recommends, scientific constructs may be useful in the threshold reliability determination, but judges ought to be careful not to overapply scientific
constructs in determining threshold reliability. An overly strict application of scientific constructs at admissibility stage will take the judge into a more strenuous analysis than threshold reliability requires.

Finally, the utility of the adversarial process should be appreciated and enhanced rather than altered with a view to better accommodate science. The enhancement can be facilitated by: providing experts with codes of conduct clarifying that their role is to assist the court, not to advocate for a party; providing juries with charges that assist them in preventing overdeference to distinguished experts and overreliance on scientific constructs; ensuring that disclosure principles are complied with so that cross-examination occurs in as informed a way as possible; and increased education for all legal players. These enhancements to the existing adversarial procedure are all likely to improve the legal system’s ability to understand and use science.

Conclusion

By idealizing science as a better truth-seeking enterprise than law, and failing to appreciate the role of procedure in maintaining the legitimacy of the legal system, science itself and scientific reasoning can be an alluring source of legitimacy for adjudicative decisions. In an effort to move away from idealization of science and towards an appropriate appreciation of it, I have attempted to outline how procedure can maintain the legitimacy of scientific inquiry, and more fundamentally to my project, to adjudicative outcomes. The culmination of the discussion surrounding procedural legitimacy was that while both science and law maintain legitimacy through adherence to their rules and procedures, both fields have different needs and goals.

Science seeks to understand empirical realities, or truths. Still, it inherently acknowledges, through the concept of falsification, that it cannot prove truths with absolute certainty. Despite these conditions of uncertainty, the inquiry into truth remains valid and “scientific” so long as it complies with the rules and procedures relevant to science, known as the scientific method. Law, on the other hand, seeks to establish legal facts, which are defined in the substantive law. The definition of legal facts includes the burden of proof required to prove a legal fact. The burdens of proof allow legal facts to be proven for legal purposes even if there is some uncertainty as to whether the legal fact really occurred or not. But even when the uncertainty manifests (i.e., a fact is found for legal purposes

98. Ibid at 503.
99. Ibid at 511.
100. Ibid at 507.
that is not a fact in reality), the adjudicative decision that results remains valid as long as procedural rules were followed.

Understanding science and law as similar, yet different, in this way is critical to determining how the legal system should accept and use science. The critiques of the commentaries of Susan Haack and Edmond Roach were intended to demonstrate the impact of failing to recognize the principle of procedural legitimacy. Although these commentators provided useful insights in their contributions, their discussions and resulting conclusions reflect a misappreciation of procedural legitimacy.

Finally, I have applied the concept of procedural legitimacy to the science and law discussion in the form of an endorsement of the recommendations put forward in the Goudge Inquiry. The Goudge Inquiry is neither overly deferential to science, nor does it ignores science's usefulness to the legal process; it neither rebukes the legal process as being incapable of dealing with science, nor does it fail to recognize its vulnerabilities. Consequently, the recommendations arising from the Goudge Inquiry are principled and balanced, and I have endorsed them on the basis that they are wholly consistent with the concept of procedural legitimacy.