University of Alberta

Defining Science for the Law of Evidence: A Comprehensive Examination of the Philosophy and Law Pertaining to Scientific Testimony in Canadian Courts

by

David Robb Hampton

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The undersigned certify that they have read, and recommend to the Faculty of Graduate Studies and Research for acceptance, a thesis entitled **Defining Science for the Law of Evidence: A Comprehensive Examination of the Philosophy and Law Pertaining to Scientific Testimony in Canadian Courts** submitted by **David Robb Hampton** in partial fulfillment of the requirements for the degree of **Doctor of Philosophy**.

Dr. Alexander Rueger

Prof. Wayne Renke

Dr. Bruce Hunter

Dr. Richard W. Bauman

Dr. William Talbot

Sept. 22, 2003

For my father, William Gordon Hampton
(1922-2003)

Abstract

The purpose of this project is to examine the use of scientific testimony within Canadian courts and address the following issues: does scientific testimony pose a problem for the epistemic task of the trier of fact and, if so, what legal procedures will best meet the epistemic needs of the law? In order to answer the first question this dissertation develops an epistemology of testimony suitable for application to the courtroom environment. I argue that legal inquiry is a justificational context where our priority rests with error avoidance. This means that justification in the legal context is internalist in character, requiring that the legal fact-finder possess reasons for factual determinations. These heightened justificatory requirements permit us to identify the problem that scientific testimony poses to inexpert courtroom determinations of fact. Lay triers of fact are called upon to evaluate expert testimony that they lack the requisite background knowledge and experience to assess.

I proceed to investigate three legal responses to the problem posed by scientific testimony: inclusionary, exclusionary, and non-adversarial. The inclusionary approach to evidence that purports to address the deficiencies of lay fact finders through the adversarial presentation of evidence. Another common legal response is to paternalistically seek to shield the legal fact-finder from evidence that may distort the fact-finding process. This is what I describe as an exclusionary approach to evidence. It seeks to mitigate the epistemic dangers of scientific testimony through the application of a standard of admissibility that will ensure that only reliable testimony comes before the trier of fact. The last legal response that I consider involves the incorporation of non-adversarial procedures into our system of law to mitigate the epistemic dangers of

scientific testimony by removing or limiting party control over the presentation of scientific evidence. I argue that all three responses expose shortcomings.

Using the conclusions drawn from my analysis of these three responses I conclude by recommending an exclusionary approach that remains adversarial in character. I propose a procedure that utilizes reliability-based criteria in a trial judge's assessment of the evidence and introduces procedures for the use of independent court-appointed experts as 'judge's aids' in order to redress the difficulties identified with exclusionary approaches.

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DEFINING SCIENCE for the LAW of EVIDENCE
CONTENTS

Introduction

This dissertation offers an analysis of how our laws of evidence should define science for the purpose of expert opinion evidence given in court. Scientific opinions have been admissible in common law jurisdictions for better than three centuries now.[1] While the place of the scientific expert in our legal system is not unusual there is nonetheless a threshold issue regarding the admissibility of scientific testimony that continues to elude a clear and satisfactory legal response. This issue concerns the philosophical question of what should qualify as, or constitute, a scientific opinion in the first place. In the jargon of the legal literature this amounts to asking how to distinguish between "good science" and "junk" or "pseudo-science."[2]

This question poses difficult choices for the law that underscore the very different epistemic principles that inform the law of evidence. On the one hand there is the general principle that all relevant evidence should be admissible. This corresponds to the principle known as the requirement of total evidence in epistemology. It reflects the venerable view that if we are interested in having the truth prevail we should consider all of the evidence relating to the matter. On the other hand the law often excludes relevant evidence. Sometimes the reasons for this are non-epistemic but in many contexts, including that of scientific opinion evidence, we do find exclusionary rules with an epistemic rationale. The basis for concern in the context of scientific testimony is the

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[1] The case of *Folkes* v. *Chadd* (1782), 3 Doug. 157, is usually cited as the foundation for the rules governing expert evidence in the common law tradition. See *R.* v. *Turner* (1974), 60 Cr.App.R. 80, at p. 83.

[2] The characterization "junk science" is, as I note, one that follows from the jargon of the legal literature. See, for example, Huber (1992) and Foster and Huber (1997). It is an uncharitable characterization as the sort of expert testimony that concerns us runs the gamut from overzealous uses of established science to novel scientific techniques whose reliability has yet to be established, to fringe or pseudo-science.

danger posed by the admission of unsound opinion evidence under the guise of science. The fear is that the background and cognitive deficiencies of layperson triers of fact - jurors or judges - may render them incompetent to adequately assess the merits of such evidence. Exclusionary rules that attempt to screen unsound science from consideration therefore introduce principles under what we may call epistemic paternalism. Given the increasing use of scientific opinion evidence in the courtroom, the potential power of this form of evidence, and the "mystique" of scientific authority, the importance of addressing this issue should be apparent.

The legal scholarship on this issue is considerable, especially in the United States, but this scholarship usually proceeds from unanalyzed assumptions concerning the source of the problem. My work here undertakes to remedy this by returning to the source and articulating an epistemology of testimonial knowledge - the conditions under which one can be said to know some fact on the basis of another's report. Only when we understand testimonial knowledge, the principal source of knowledge in a trial determination of fact, can we begin to diagnose the special problems associated with expert testimony and evaluate the evidential response that the law could employ to remedy the problem. Of course, the issues that confront us here are not merely epistemological. This work is also one of applied epistemology: it seeks a response to the question of how our law should deal with scientific testimony that is feasible within our existing legal context. It is an important assumption of this work that proposals demanding significant departures from our existing institutions and practices would have little real chance of implementation. This work is thus what Goldman characterizes as a "local evaluation" of our legal

practices; it evaluates the veritistic merits of various candidate responses, and renders ameliorative suggestions, without envisioning "wholesale redesign" of the system.[3] This is in contrast to what one may characterize as a "global evaluation" that would evaluate the veristic merits of our system against other real or possible legal systems - and offer conclusions concerning the veristically optimal practices accordingly.

The chapters of this work build upon one another drawing upon philosophical analysis from epistemology and the philosophy of science as the legal discussion progresses. In Chapter 1, I discuss the epistemic context of the law of evidence introducing the principles that inform the inclusionary and exclusionary tendencies in the law, and situating the problem of scientific testimony within this context. A topography of legal responses - inclusionary, exclusionary, and exclusionary non-adversarial - are introduced at this time. The first of these approaches places no restriction other than that of legal relevance and a properly qualified expert upon the admission of scientific testimony. As such, this approach reflects the principle I characterize as the requirement of total evidence. It relies upon the "virtues" of the adversary system, cross-examination and the presentation of contrary witnesses, to reveal dubious science. The other approaches are epistemically paternalistic and introduce mechanisms to screen putative scientific testimony. The first of these, the exclusionary approach, would require a legal test, some set of criteria, that a judge could apply to determine whether the opinion is sufficiently reliable to go before the court. The other paternalistic approach reflects the view of some commentators that the adversarial courtroom is not a satisfactory

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[3] Goldman (1999), at p. 290.

environment for airing the merits of scientific fact-finding. This approach recommends the use of extra-judicial means, such as the use of independent court-appointed experts, to demarcate admissible science from non-admissible science or non-science.

I examine the inclusionary approach in Chapter 2. Many commentators regard such an approach as inadequate for dealing with scientific testimony. To understand whether there is a problem with knowledge founded upon expert testimony it is necessary to provide a defensible account of testimonial justification and situate the analysis of courtroom scientific testimony within this account. Chapter 2 examines the epistemology of testimony and sets forth a general account of testimonial justification suitable for application to the legal context. In Chapter 3, I proceed to extend the general account of testimonial justification to the legal context and locate the source of the difficulty for scientific testimony in the interest that the legal system has in error avoidance and the justificatory standards that arise from this requirement.

Having established the problem associated with scientific testimony from an inclusionary standpoint in the preceding chapter, I move in Chapter 4 to an examination of the exclusionary response. I discuss the rationale for this approach in light of the epistemology of testimony presented in Chapter 2 and applied to legal inquiry in Chapter 3. In order to evaluate candidate tests for admissibility I establish a set of standardized criteria for assessing exclusionary proposals. A number of exclusionary models, real and hypothetical, are then examined in Chapters 4 and 5 with the assistance of these criteria. The familiar philosophical issue concerning the demarcation of science from non-science,

and all of the problems associated with it, arises in the process of this discussion.[4] I conclude Chapter 5 by examining the philosophical arguments that lead to a rejection of a demarcationist basis for an exlusionary rule, how they apply to the search for a viable exclusionary standard, and suggest that a more promising basis for determining admissibility rests with a standard that focuses upon epistemic reliability.

Chapter 6 proceeds from the examination of non-adversarial responses, prompted by the continental legal tradition and its handling of scientific testimony, to the difficulties outlined earlier in the work. The use of independent court-appointed experts in the German federal system, and a proposal that attempts to incorporate significant features of this system into our own system, are critically examined. The same criteria for evaluating exclusionary tests, developed in Chapter 4, are utilized to evaluate the non-adversarial approach. We shall see that, while such an approach yields potential epistemic gains, it nevertheless fails as an option when other moral and political objectives of our legal system are incorporated into the evaluation.

In the final chapter I engage the ultimate aim of the project: namely, the provision of a recommendation regarding the use of scientific testimony that best meets the epistemic and practical needs of the law. Utilizing the analysis and conclusions of the preceding chapters, I propose an exclusionary approach to the admissibility of scientific testimony that builds upon existing case law and procedure, introduces new procedures, and advocates that reliability-based principles should guide the future development of the

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[4] See Chapter 5, Section 3, for a discussion of some of the problems associated with demarcating science from non-science.

common law in this area. This proposal is then examined from the standpoint of the criteria articulated in Chapter 4 and various shortcomings of this approach are addressed.

Chapter 1 - The Law's Epistemology

The chapters that follow concern a problem in the law of evidence arising from expert scientific testimony in court. Strange as it is, legal treatments of evidential issues such as this one tend to proceed absent any explicit epistemological analysis. Sadly, philosophers who concern themselves with the law have also largely ignored the wealth of epistemological applications arising with respect to the law. In this analysis, however, epistemology will take center stage. Epistemology is a normative inquiry that studies the conditions of justified belief, that is, beliefs that are permissible or reasonable for one to hold from an epistemic point of view. In this project I assume that the goal of knowledge-producing inquiry is veritistic, that is, the acquisition of true belief is, as Goldman states it, "the common denominator of intellectual pursuits."[1] Epistemology thus concerns the conditions under which one may be said to justifiably possess true beliefs. In addressing the problem that will comprise the balance of this work I shall proceed on the understanding that legal inquiry is veritistic inquiry and that the law of evidence often reflects epistemic rationales. The task of this chapter is thus as follows: (a) to defend the claim that legal inquiry is veritistic; (b) to establish the broad epistemic principles that inform the law of evidence; (c) to present the problem that concerns this project; and (d) to offer a topography of legal responses reflecting the broad principles established.

1.1 The Legal System and Veritism

It is a commonplace occurrence to hear our adversary system of legal inquiry characterized as one of truth seeking. Witnesses testifying in legal proceedings swear an

oath to God, or make an affirmation, to tell the truth.[2] Courts routinely describe the task of the legal fact-finder as that of truth-seeking.[3] Proponents of the adversary system defend this form of legal inquiry, characterized by the partisan presentation of evidence and equally partisan cross-examination, as the 'greatest engine ever devised' for uncovering the truth.[4] Indeed, this latter claim is commonly treated as one of the principal consequentialist justifications of the adversary system. Despite these commonplaces, the notion that our system of legal inquiry is veritistic, both in goal and in practice, is by no means a universally shared belief. This project builds upon the claim that veritism - truth seeking - is, in fact, an objective (one of several) of legal inquiry.[5] It is therefore incumbent upon me to respond to those that would question this claim.

Consider the following claims:

> To the uninitiated, it may come as a great shock that our system of justice does not really involve a search for truth. Professor Younger used to disabuse his students of this notion in the very first minute of his course on evidence. He stated that the trial lawyer is concerned with building a *model* of events that occurred outside the courtroom. Once that model is constructed, it supplants external reality, rendering the objective *truth* irrelevant.[6]

> Advocates in the adversary system do not necessarily attempt to convince the court or tribunal to find the truth; they attempt to convince the court or tribunal to find facts favouring their clients' interest. Nor do they necessarily restrict their attempts to convince to the merits of the issues. Tactics involving obfuscation, distortion,

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[1] Goldman (1987), at pp. 109-144.

[2] See, for example, the *Canada Evidence Act,* R.S., c. E-10, ss. 13,14(1), and 16.

[3] See, for example, *R.* v. *Ferguson* (1996), 112 C.C.C. (3d) 342 (B.C.C.A.), in which the court, commenting on Section 16(3) of the *Canada Evidence Act,* observes that a a promise to tell the truth implies an understanding of the difference between telling the truth and telling a lie, and the nature of a promise. See also, *United States* v. *Liddy*, 509 F. 2d 428 (1974, D.C.), at p. 438, and *Daubert* v. *Merrell Dow Pharmaceuticals, Inc.,* 113 S.Ct. 2786 (1993), at p. 2798.

[4] See Wigmore (1974), at p. 32.

[5] There are, of course, other objectives besides truth-seeking that are part of our legal system and which may impact upon legal inquiry. The values of human dignity, fairness, individual liberty, and the need to impose effective inhibitions upon the use of power by the state, may also be said to be objectives of our legal system - ones that provide constraints upon the form and substance of legal inquiry. See, for example, Arbour and Taman (1980),Chapter 1. The laws of evidence that structures legal inquiry may also serve as instruments to further state policies; see, for example, Mueller and Kirkpatrick (1999), at pp. 2-3.

[6] Kestler (1992), at p. 4.

> obstruction, delay, and *ad hominem* attacks are all too frequently adopted.... In practice, cases in which there are gross disparities in the ability of counsel or the finances of the parties, or both, are common. It has become almost a platitude that if one has a choice of choosing either the better lawyer or the better case, one would be well advised to choose the better lawyer.[7]

> The two adversary attorneys, moreover, are each under an obligation to present the facts in the manner most consistent with their clients' position - to prevent the introduction of unfavorable evidence, to undermine the credibility of opposing witnesses, to set unfavorable facts in a context in which their importance is minimized, to attempt to provoke inferences in their clients' favor.[8]

The latter two statements, offered by Gavin MacKenzie and David Luban, represent criticisms of the argument that our adversary system is justified because it is "the best way of ferreting out truth." Both MacKenzie and Luban acknowledge that truth-seeking is a goal, and presumably an attainable one, of legal inquiry. Their complaint is that, as a matter of empirical fact, the extremes of our adversary system serve as an impediment to the objective of truth seeking within legal inquiry. My intention here is not to offer a defence of our adversary system, in all of its aspects, as a veritistically optimal form of inquiry.[9] My focus in this project is upon the rules of evidence; that we have an adversary system is only relevant insofar as the enveloping values that underwrite that system also inform our evidential procedures. Nor do I wish to deny that, as articulated by MacKenzie and Luban, our system has other goals besides truth seeking. Our legal system also possesses legitimate moral goals, efficiency goals and pragmatic (or trial tactical) goals. Both of these matters, the adversary system and the interplay of epistemic and other goals of legal inquiry, will come to play an important role in my Chapter 6 analysis. For now, my concern rests with a more damaging sort of critique to my position that tends to

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[7] MacKenzie (1996), at pp. 106 and 107.

[8] Luban (1988), at pp. 69-70.

[9] I would note, however, that I believe criticisms of the sort offered by MacKenzie and Luban overstate the extent to which veritistic goals are lost to other goals within our adversary system.

emerge from the empirical observation that these goals sometimes seem to conflict or overshadow veritistic goals.

The Kestler passage, quoted above, succinctly describes this other view: legal inquiry is not veritistic at all. It rather aims at a just and efficient resolution of disputes. Indeed, this is itself a relatively benign characterization of the aim of legal inquiry; I have known some lawyers to liken legal inquiry to something more akin to public entertainment - a 'show' merely to placate the public's sense that justice be done.[10] I will confine my comments here to the more serious legal-inquiry-as-dispute resolution model. At stake, under this model, are simply competing interests under the law and what matters is merely the task of securing the best possible outcome from the standpoint of the client's interest.[11] A survey of the literature concerning the merits of the adversarial model of justice will quickly disclose numerous anecdotal references to instances where lawyers appear to be actively working to obscure the 'truth' in the service of their client. If the empirical basis for the complaints of critics like MacKenzie and Luban is correct, this can lend some *a posteriori* credence to the contention that legal inquiry is not veritistic at all. Where MacKenzie and Luban believe, however, that the alleged lack of

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[10] One legal practitioner that I know is apt, on some (bad) days, to characterize legal inquiry in a manner consistent with this law-as-a-show perception. The perception, shared by many practicing lawyers, that legal inquiry doesn't have anything at all to do with a search for the truth stems, I believe, from their 'front-line' emersion in the practice of law. Confronted with the thousand-and-one procedural battles and posturing that comprises much actual legal practice, it is easy to understand how practicing lawyers can become jaded with the notion of veritism as a goal of legal inquiry. Truth-seeking, as I shall argue below, is a systemic goal that (we hope) emerges from the process functioning as a whole. The common failing of practitioners who fall into this sort of talk is therefore that they 'lose sight of the forest through the trees.' When one questions a lawyer, my friend for instance, about what the facts of the case are, what the lawyer seeks to accomplish in leading evidence, or why it is important to proceed with the matter, the answers typically betray the veritistic underpinnings of our legal system.

[11] Kestler (1992), at pp. 6 and 7.

truth seeking is a shortcoming of our legal inquiry, authors such as Kestler seem to embrace this deficiency. Why is this?

The reason that some fail to regard the alleged lack of truth seeking in our legal inquiry as a deficiency is to be found in a deeper perspective on the nature of law and the limits of human inquiry that underlies many of these characterizations. This perspective takes its cue from the legal pragmatist [realist] movement of the last century.[12] Posner identifies three elements to this understanding of the nature of law:

> The first is a distrust of metaphysical entities ("reality," "truth," "nature," etc.) viewed as warrants for certitude whether in epistemology, ethics, or politics. The second is an insistence that propositions be tested by their consequences, by the difference they make - and if they make none, set aside. The third is an insistence on judging our projects, whether scientific, ethical, political, or legal, by their conformity to social or other human needs rather than to "objective," "interpersonal" criteria.[13]

One can readily identify the challenge that this perspective poses to the claim that legal inquiry is veritistic. The pragmatism of the sort suggested here "distrusts," perhaps even rejects, the commonplace understanding of truth as a correspondence between propositions and an external reality that is independent of us. It is not simply that legal inquiry possesses aims that overshadow veritistic aims, rather, the challenge here is to the very notion that veritistic inquiry is possible. Thus we understand why the legal pragmatist will willingly embrace the very sorts of characteristics that critics such as Luban and MacKenzie find problematic. A pragmatic resolution of disputes, regarded as competing interests or perspectives under the law, is all that the legal pragmatist regards as attainable under inquiry (legal or otherwise).

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[12] Throughout this chapter I will refer to the form of legal realism that I am criticising as legal pragmatism in order to clearly distinguish it from metaphysical realism.

[13] Posner (1991), at pp. 35-36.

Defending a realist (or commonsense) view of truth is a project unto itself and well beyond the scope of this work. The notion that veritistic inquiry is possible underpins one of the central claims, noted above, of this work: that truth seeking is a goal of legal inquiry. Some effort is therefore necessary to address the philosophical perspective that informs the purely pragmatic account of legal inquiry. What is the basis for this anti-realist distrust of the traditional conception of truth that informs the legal pragmatist position? Three sorts of argument figure in contemporary philosophical literature. The first of these is the bulwark of the anti-realist position. This is what Kitcher describes as the "inaccessibility of reality argument." The conventional correspondence understanding of truth takes there to be referential relations between elements of representation - internal states of beliefs, maps and the like - and external things in the world. Kitcher writes, "These referential relations, together with the state of reality, jointly determine the truth values of statements and the accuracy value of other forms of representations."[14] The anti-realist will, however, question our ability to transcend the phenomenal world of our representations to 'check' this supposed correspondence relation against the things-in-themselves. So, for example, we find Rorty writing,

> To drop the idea of languages as representations, and to be thoroughly Wittgensteinian in our approach to language, would be to de-divinize the world. Only if we do that can we fully accept the argument I offered earlier – the argument that since truth is a property of sentences, since sentences are dependent for their existence upon vocabularies, and since vocabularies are made by human beings, so are truths.[15]

The inaccessibility of reality argument is often buttressed by two further arguments. There is the contention that our beliefs about states of affairs in the world are not caused

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[14] Kitcher (1994), at p. 123.
[15] Rorty (1989), at p. 21.

by discovering facts but rather by socially constructing, or 'negotiating' them.[16] Another argument proceeds from an alleged underdetermination of fact by cultural and temporal contingency. The claim here is that objective fact is underdetermined by historical and temporal circumstance since throughout history, and across cultures, wildly differing conceptual schemes have succeeded in allowing the agents that utilized these schemes to succeed, where success is identified with "coping with the world."[17] Since success in this manner is presumably the only measure of the adequacy of our representations we are arguably left with the conclusion that there is no one true representation of reality.

Let us assume for the moment that these arguments underlying the legal pragmatist's rejection of veritism are correct. How do we construe legal inquiry once truth seeking is removed from consideration as a goal of this form of inquiry? What are we to make of the law's stated concern with the truth and legal procedures that ostensibly have an epistemic (veritistic) rationale?[18] I noted above that, for the legal pragmatist, the goal of legal inquiry will be construed as merely one of dispute resolution. Under this perspective on the limits of human inquiry we are presumably to understand exhortations to truth-seeking occurring within the law as (really) denoting nothing more than 'good to believe.' What matters, the legal pragmatist will claim, is that out of competing interpretations of the facts surrounding a dispute one model of what occurred is selected through the process of legal inquiry and that the procedures utilized to render this selection enjoy the confidence of the public.

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[16] See, for example, Bloor (1991), Latour and Woolgar (1986) and Rorty (1982). This constructivist critique also has attraction to radical critics, such as some Marxists and Feminists, who wish to claim that facts are negotiated in the service of empowered interests.

[17] See, for example, the Introduction to Rorty (1980); see also Rorty (1989), at p.21.

The notion of truth as an *honorarium* that we attach to propositions that we find useful may be wedded to our understanding of legal inquiry without too much ado, but it is more difficult to understand, from a pragmatist's perspective, the utility of legal procedures - rules of evidence – that possess clearly veritistic rationales. Are we to understand these procedures as little more than the misguided hangovers of an outmoded philosophical culture? One possible answer that the pragmatist is apt to provide us is that, 'the goal of truth must be honored even in the breach,' since we are not yet, as a culture, at the stage of endorsing the post-philosophic conception of truth.[19] Legal procedures with veritistric rationales do not, on this understanding, *actually* serve their veritistic ends. Their utility rather rests with the satisfaction of common expectations and presumptions about the veritistic aims of legal inquiry.

How should one respond to the forgoing attack upon veritism within the law? A response, it seems, must be made to the *a posteriori* arguments presented as well as the deeper claims made by the pragmatist regarding the nature of inquiry. Let's first consider the argument that legal inquiry does not, in fact, seek the truth. As I noted above, my intention here is not to offer a defence of our adversary system as an ideal or optimal form of veritistic inquiry. The sorts of systemic features that attract the ire of critics such

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[18] I shall examine some instances where rules of evidence disclose a veristic rationale in the following section.

[19] Goldman notes this sort of dynamic to the anti-realist's discourse: "Many an ideology, discourse structure, and conceptual scheme has been embraced in the interest of power rather than an interest in truth, as sundry theorists such as Marxists, Nietzsche, and Foucault have stressed. Still, proponents of such positions must fly their public claims under the banner of truth, or eventual truth attainment. They know this is the *presumptive* aim of intellectual claims. To admit that one's favored methods or policies are mere self or class-serving fictions, that they have no genuine propensity to conduct people on a path toward truth, is an admission of intellectual bankruptcy. The goal of truth must be honored even in the breach, just as the goal of winning must be simulated even by an athlete who seeks to 'throw' the contest." Goldman (1987), at p. 125.

as Luban are undoubtedly present within our system. The critic of this sort and I both share the conviction, however, that our system of law has veritistic aims and that such aims can be realized through inquiry. The fact that our system emphasizes aims other than veritistic ones is no argument against the proposition that the law has veritistic aims as well - indeed, in the next section I shall examine some rules with explicitly epistemic rationales - or that, given better procedures, the law might even achieve those epistemic aims. Consider the following analogy. I have very poor eyesight, which means that I am often unable to see the hare that sits out on the front lawn of the Humanities Centre. The fact that I don't typically see the hare does not mean that seeing the hare cannot be a goal; nor that with some amelioration (I remember my eyeglasses) I might achieve this goal. In order for the fact that I don't typically see the hare to be a decisive consideration, either in terms of the choice of this as a goal or in my prospects of success, one must offer some argument as to why, in principle, this goal is unachievable. Likewise, the pragmatist's characterization of legal practice as non-veritistic is only decisive if the deeper argument concerning the non-viability of truth seeking inquiry stands.

Let us begin with the bulwark of the pragmatist position, the inaccessibility of reality argument. Many philosophers regard the pragmatist's abandonment of veritism to be pernicious. For many it is hard to resist the pull of the traditional correspondence conception of truth. Goldman conveys this well in the first chapter of *Epistemology and Cognition.* He invites us to consider an "unfortunate victim of circumstance and misidentification" charged with some crime. The fellow is unfortunate because he is *in fact* innocent of the crime. Circumstances and misidentification, however, make it evidentially next to impossible for external agents to resist the conclusion that he is

guilty.[20] Given the legal pragmatist's account an agent, a juror for example, presumably would have a justified "true" belief that the unfortunate man is guilty. Goldman argues, however,

> The only correct sense of 'true' makes truth independent of how well it can be defended. Its defensibility is a separate matter, which may depend on a variety of extraneous circumstances. Any innocent person accused of a crime surely wants the real *truth* to emerge;and the real truth is all that is normally meant by 'true.'[21]

Goldman is, of course, expressing a distinction here between what is a metaphysical matter, the nature of truth, and what is an epistemic matter, our evidence or warrant or justification for some given proposition. The sense of truth that Goldman expresses here, the traditional correspondence notion, is so great a feature of how we regard the world, so familiar to our experience, that his example seems almost a *reductio ad absurdum* of the pragmatist's account.

The key, however, is that the pragmatist denies offering any account of truth. He is not suggesting that we create the 'real truth' in creating an account. He is no idealist for he surely believes that there is an external world that has a causal impact upon us as well as our beliefs about that world. The piece of intellectual gymnastics that the pragmatist invites us to perform is to recognize that what Goldman calls "the *real* truth" is a wheel that turns nothing. So we find pragmatist responses of the following sort:

> I suppose we might say, non-controversially if pointlessly, that the *truth* of what we say is not just for a time or place. But that high-minded platitude is absolutely barren of consequences, either for our standards or warranted assertibility or for any other aspect of our practices.[22]

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[20] This unfortunate hard timer knows that he is innocent but this is a view that he cannot defend against all comers; that is something nobody can do *given the evidence.* Goldman (1986), at p. 18.

[21] *Ibid.*

[22] Rorty (1993), at p. 460.

The pragmatist hopes to persuade us that his approach is the best we can hope for on the basis that truth in any stronger sense (such as that which underlies veritism) is an empty notion. To make out this claim he offers the kinds of arguments canvassed above: the inaccessibility of reality argument, the argument from social construction, and the argument from cultural and temporal underdetermination of fact.

Kitcher provides a more direct response to the inaccessibility of reality argument. He asks us to consider a group of subjects charged with the task of charting a route – say across town. We provide each subject with a map that displays various landmarks; the maps, however, differ in ways that occasionally are salient. Each subject examines his map and forms his beliefs concerning how the destination relates to the actual objects represented by the landmark symbols on the map. Some of the subjects succeed in finding the destination while others enjoy less success. We explain the difference in success, "in part, by noting the relations between the map and the domain mapped – or, derivatively, the relations between the representations induced by the map and the objects among which they are trying to navigate."[23] We explain, that is, our subject's patterns of success by noting a correspondence between the map and things in the world. This account should not, so far, attract any anti-realist ire since "the entities that are independent of the subjects whose behaviour is explained are 'internal' to the worldview of the observer(s)."[24] The critical point for Kitcher's realism is why, in the foregoing scenario, should the presence of an observer matter? He writes,

> But real realists think that this point about the presence of an analyst is trivial. Why should relations between the subject, the subject's representations, and the independent

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[23] Kitcher (1993), at pp. 166-167. See also Kitcher (2001), at p. 181-183.
[24] Kitcher (1994), at p. 123

> objects depend on the presence of another to note them? Why should the presence of an observer affect the connection between accurate representation and success?[25]

The answer to Kitcher's rhetorical questions is that relations between our subjects, their representations, and the objects represented, don't depend on the presence of an observer. Even if we were not around to watch our subjects, they would still navigate as they do. Realism, Kitcher argues, simply amounts to generalizing from the mundane sense in which one explains the behaviour of others, and the success of their representations, to an account that could be given "for each of us independently of the presence of any other observer, and for *all* of us...."[26] Direct access to a mind independent reality consists then, in the "pattern of causal relations involving objects, representations, and [the subject's] behaviour."[27] The problem of inaccessibility, or the need for an Archimedean standpoint from which one could apprehend both things-in-the-world and the terms that refer to them, should not arise.

The notion of successful behaviour in interacting with the world plays an important role here. Why, however, should the success of our representations provide any comfort to the realist? It is a common enough skeptical move within traditional epistemological discourse to suggest that our patterns of strong success in representing the world could just as easily be the consequence of fortuitous accidents. To alleviate this sort of concern Kitcher borrows an argumentative device from the debates over scientific realism: the miracle argument. He writes:

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[25] Kitcher (1994), at p. 123.
[26] Kitcher (2001), at p. 185.
[27] *Ibid.*, at p. 184.

> Viewing skilful practice as sometimes grounded in beliefs that correspond to nature, we can contend that it would be extraordinary if we were to be able to interact so successfully with the world on the basis of distorted representations of it.[28]

The argument here is one from abduction. It invites us to seek an "explanation of the connection between the representational states that are casually efficacious in their practice and the successful outcome of that practice...."[29] Without this sort of explanation, that strongly successful representations do accurately correspond to states of affairs in the world, we would have to posit an altogether miraculous set of coincidences to explain that success. BonJour has taken this argument further still, to suggest that it is *a priori* probable that our representations do in fact correspond to the world since, as a probabilistic matter, the series of added propositions required to explain consistent systemic error or 'demon-world deceptions' would necessarily render such explanations less likely than the realist candidate explanation.[30] While the realist arguments just examined are not the last word on the matter they do, I submit, provide intuitively compelling rejoinders to the claim that we cannot escape the contingencies of our vocabularies to know the world in a way that is adequate to the world.

In articulating the pragmatist's position I noted two other supporting arguments; one proceeding from the social negotiation of facts and another proceeding from the cultural and temporal underdetermination of facts. These arguments, however, lose much of their purchase once the inaccessibility argument fails to convince. No realist should deny that social negotiation features in our conceptual categorization of external reality. The fact that this sort of negotiation occurs, and sometimes presents us with differing

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[28] Kitcher (1993), at p. 170.
[29] *Ibid.*, at p. 171.
[30] See, for example, BonJour (1985).

conceptual categories, is no argument against realism unless one's realism endorses the notion, "that the world is precategorized into truth like entities (facts), and that truth consists in language or thought mirroring a precategorized world."[31] Goldman notes, however, that a notion of 'fittingness' is just as amenable to our realist intuitions while capturing what is correct in constructivist accounts that emphasize the role of social negotiation. This suggests that, as Davidson aptly put it, we may only be words, and not worlds, apart. Goldman writes:

> Which things a cognizer-speaker chooses to think or say about the world is not determined by the world itself. That is a matter of human noetic activity, lexical resources in the speaker's language, and the like. A sentence or thought sign, in order to have any truth-value, must have an associated set of *conditions of truth*. Exactly what determines truth-conditions for a sentence or thought sign is a complex and controversial matter. But let us assume that a given utterance or thought, supplemented perhaps with certain contextual factors, determines a set of truth conditions. The question then arises whether these conditions are satisfied or not. The satisfaction or non-satisfaction of these conditions depends upon the world.[32]

Only if we have previously eschewed the notion of the world "answering to" whatever truth conditions are in play, for example by accepting the inaccessibility argument, would we regard the negotiation of conceptual categories as supporting the pragmatist's rejection of veritism. Provided that the realist response to the inaccessibility argument is compelling, or at least provided that it shifts the argumentative burden back upon the anti-realist, there is no reason to suppose that veritism should be rejected on the basis of the social negotiation argument alone. If we understand correspondence in the manner suggested by Goldman, the realist contention that what makes a proposition true depends upon external states of affairs in the world is entirely consistent with the fact that conceptual categories are socially negotiated.

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[31] Goldman (1986), at p. 152. Also echoed in Kitcher (2001) at p. 184.
[32] *Ibid.*, at p. 153.

The second sort of supporting argument, that which proceeds from the temporal and cultural underdetermination of fact, also fails to convince. This argument depends upon the articulation of inconsistencies between modes of representation across time and culture, and the observation that these modes of representation enjoy or have enjoyed equal success in terms of allowing those that use or utilized these modes to cope with their external environment. There is some good sense to this argument; modes of representation that survive would surely not do so unless they enjoyed *some* success. The difficulty for the argument's radical conclusion arises, however, from the brute use of the term success. There are many forms of success. The promotion of social cohesion, empirical adequacy, explanatory power, and predictive power are just a few forms of success that come to mind. When many forms of apparently inconsistent successful forms of representation are unpacked it is often the case that their success can be attributed to the differing ways in which these representations permitted their users to cope with the world.[33] In other instances we find that the classifications induced, while false in many respects (for example, with respect to their ontologies), still exhibit some taxonomical fittingness. The much maligned phlogiston theory, often cited as an example of a successful yet false mode of representation in the anti-realist arsenal, nevertheless induced a kind-taxonomy with a degree of representational fittingness that explains the empirical and predictive success enjoyed by the theory.[34] Unpacking the notion of success can thus dissipate the seeming inconsistencies that the anti-realist depends upon to ground the underdetermination argument. When we unpack success in this way realism

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[33] Kitcher (1994), at pp. 127-128.
[34] Carrier (1993), at p. 405.

can accommodate the variations in modes of successful representation across time and culture without difficulty.

At the outset of this philosophical interlude I noted that, while a defence of the realist conception of truth was beyond the scope of this work, some argument was necessary to respond to the philosophical underpinnings of a purely pragmatic account of legal inquiry. The realist arguments just rehearsed do, I submit, suffice to shift the argumentative onus back upon the more exotic claims of the legal pragmatist with respect to the veritistic goals of legal inquiry. The question remains, however, as to why veritism should be a goal of legal inquiry. What is the connection between legal inquiry and truth?

It is tempting to argue that the connection between legal inquiry and truth is an *a priori* connection. That is, a legal system seeks, through a system of rules and procedures, to determine the non-legal material facts of the matter (what happened) and, through the application of law, to render judgment (guilty/not-guilty; liable/not-liable).[35] If it is the task of a legal system to ascertain what happened, then truth-seeking would seem to be self-evidently a feature of such a system. This move is, perhaps, too quick. Once one has the nature of law associated with a system that seeks to determine material facts the claim that veritism is, *a priori*, a goal of legal inquiry is correct. The association of a system of law with that sort of determination is, however, precisely what is at issue. There are many forms of dispute resolution that are conceivable that would not entail veritism. The legal pragmatist's characterization of legal inquiry as the attempt to persuade in favor of one's client is one such example. We could also conceivably render resolutions of disputes by coin toss, considerations of political expediency, or blind guessing - none of these forms

of 'fact' construction need involve a commitment to truth.[36] What makes these these sorts of non-veristic systems fundamentally non-legal?

I wish to offer a strong claim regarding the connection between law and truth: that veritism is a part of what Hart described as the minimum content of natural law. Hart is by no means a natural law theorist. In *The Concept of Law,* however, he attempts to articulate the "good sense" embodied within natural law theory through a discussion of what he calls the minimum content of natural law.[37] Placed into metaphysical terminology his contention is that law [weakly?] supervenes upon certain subvenient contingent natural facts about human beings, their aims, and natural environment.[38] The sorts of natural facts that Hart has in mind are ones, "concerning human nature and the world in which men live," and which render certain features of law a "natural necessity" for survival in any complex human social environment.[39] This content is a "minimum" because it is not sufficient for an articulation of the nature of law.

Why should veritism feature in this minimal sense of natural law? The basis of Hart's claims concerning the minimum content of natural law is that there are facts and

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[35] Goldman (1999), at pp. 273-274.

[36] Of course, these forms of inquiry could claim truth seeking as a goal and, if sufficient numbers of the community that employed such methods were actually confident that such methods yielded truth, such methods would at least have the appearance of meeting the requirement of natural justice that I suggest here. Trial by combat endured for a time despite its dubious credentials for determining truth. What mattered were the enveloping beliefs that sustained the belief that such a system was veritistic; for example, the notion that God would favor the party that was in the right. That is, acceptability can go some distance to explaining why such a system endures, but such acceptability is not sufficient for justice. Goldman discusses this issue to some extent; see, Goldman (1999), at p. 282.

[37] Hart (1994), at pp. 199.

[38] Hart's purpose in this discussion is to articulate the sense in which there is a connection between law and morality. His contention is essentially that both law and morality supervene upon some of the same subvenient facts and properties. Hart's task is irrelevant for my purposes here as my interest in Hart's notion of the minimum content of natural law is unconcerned with the issue concerning the connection between law and morality.

properties concerning humans and their environment that necessitate certain features of any system of law in a complex social milieu. I need, therefore, to identify what facts or properties about us necessitate veritism as a natural feature of law. One may begin by noting that truth-seeking has been characterized as "intellectual due process" within a legal system.[40] We find the notion in Rawls' *A Theory of Justice*:

> Thus a legal system must.... contain rules of evidence that guarantee rational procedures of inquiry. While there are variations in these procedures, the rule of law requires some form of due process: that is, a process reasonably designed to ascertain the truth, in ways consistent with the other ends of the legal system, as to whether a violation has taken place and under what circumstances.[41]

What this passage is pointing toward is the notion that a just resolution of disputes requires, or necessitates, a process that is both epistemically nonarbitrary and calculated to be conducive to attaining the truth. The notion that justice requires true assignments of liability is clearly echoed within the jurisprudence of the Anglo-American tradition. Lord Morris of Borth-y-Gest writes,

> The desire of any court must be to ensure, so far as possible, that only those are punished who are in fact guilty. The duty of a court to clear the innocent must be equal or superior in importance to its duty to convict and punish the guilty.[42]

Or consider Rule 102 of the U.S. Federal Rules of Evidence:

> These rules shall be construed to secure fairness in administration, elimination of unjustifiable expense and delay, and promotion of growth and development of the law of evidence to the end that the truth may be ascertained and proceedings justly determined.[43]

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[39] *Ibid.*, at pp. 192-193, and p. 199. The specific facts that Hart identifies are human vulnerability, approximate human equality, limited altruism, limited resources, and limited understanding and strength of will; pp. 194-198.

[40] Brewer (1998), at p. 1672.

[41] Rawls (1971), at pp. 238-239.

[42] *S. (An Infant)* v. *Recorder of Manchester*, [1970] 2 W.L.R. 21, at p. 37.

[43] U.S. Federal Rules of Evidence, r. 102.

Or, close to the issue of scientific testimony, consider the following passage from the decision in *In re Japanese Electronic Products Antitrust Litigation*,[44] considering a 'complexity exception' to the right to a jury trial under the U.S. Constitution:

> The due process objections to jury trial of a complex case implicate values of fundamental importance. If judicial decisions are not based on factual determinations bearing some reliable degree of accuracy, legal remedies will not be applied consistently with the purposes of the laws. There is a danger that jury verdicts will be erratic and completely unpredictable, which would be inconsistent with evenhanded justice. Finally, unless the jury can understand the evidence and the legal rules sufficiently to rest its decision on them, the objective of most rules of evidence and procedure in promoting a fair trial will be lost entirely. We believe that when a jury is unable to perform its decision making task with a reasonable understanding of the evidence and legal rules, it undermines the ability of a district court to render basic justice.[45]

All of these examples pay homage to a connection between justice, due process, and truth-seeking. Reconsider Goldman's example of the unfortunate victim of misidentification convicted of a crime. The example is meant to illustrate the difference between truth and mere warrant or justification. I submit that the choice of context in the example is interesting in a way that sheds light upon the claim presently under consideration. Goldman chooses his example from a legal context and the 'bite' of the particular case emerges from our natural association of truth finding with the requirements of justice: "Any innocent person accused of a crime surely wants the real *truth* to emerge...."[46] The nature of the connection, as I believe Lord Morris states most directly, is that the duty of a system of law must be to ensure, so far as possible, that liability is attached only where it is due.

What, however, makes this connection between law and truth-seeking a natural fact? The notion of a just resolution, the proper imposition of sanction or the decision not

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[44] *In re Japanese Electronic Products Antitrust Litigation*, 631 F.2d 1069 (3d Cir. 1980).
[45] *Ibid.*, at p. 1084.
[46] Goldman (1986), at p. 18.

to do so, rests upon the natural psychology of 'just deserts.' That is, our natural sense that whenever sanction is imposed it should punish only those that are deserving of sanction - *those who actually are responsible.* The determination of actual responsibility, however, depends upon a determination of fact – what Goldman calls the real truth in the example above. It is the ability of a system to accurately assign responsibility based upon a determination of material fact (veritism) that is one of the distinguishing features of a system of law from the other non-veritistic dispute mechanisms canvassed. Without the connection between law and truth-seeking, a legal system could not long endure. Such a system would be an atrophied system of justice in which the connections made between the assignments of liability and responsibility were either arbitrary, or accurate only by chance. Why is this important? A legal system requires that most of the persons subject to it respect and obey the law most of the time; that is, the system requires the assent of its subjects. Now it is difficult to imagine a system receiving the assent of its subjects if disconnects between the assignments of liability made by the system, and our natural sense of just deserts, were routine affairs. Only in situations where such routine disconnects are backed by the barrel of a gun (the prospect of Koestler's *Darkness at Noon*) or sustaining myths (God and truth are on the side of the victor in trial by combat) is it plausible to imagine non-veritistic or patently sub-optimal veritistic systems attaining any assent at all.

Let's review the argument. I have argued that truth-seeking is a feature of the minimum content of natural law. In order to be such a feature there must be natural facts about us that necessitate a connection between a system of law and truth seeking. That feature, I suggest, resides in the natural psychology of just deserts. That is, our natural

psychology demands that a just resolution of disputes should ascribe liability where liability actually is due. This requires truth seeking - the attempt to determine what actually happened so as to assign responsibility. Of course, once we see that the nature of law requires the attempt to determine the material facts of a matter, truth seeking as a goal of legal inquiry becomes an *a priori* matter.

1.2 Two Epistemic Principles

In our system of law the determination of the facts that will resolve the dispute proceeds through the presentation of evidence to the fact finder (judge or jury). In Section 1.1, I argued that this process has veritistic aims; the courtroom presentation of evidence is, in part, a search for the truth of what occurred. If truth seeking is a goal of our legal inquiry a natural question presents itself: what are the epistemic principles that govern the presentation of evidence at trial? In his article "Communication Control in Law and Society" Goldman explores this topic and describes two sorts of views on evidence that we can rightfully describe as informing those evidential procedures that possess truth-seeking rationales. The epistemic principles that he identifies can be described as "the requirement of total evidence" and "epistemic paternalism." While these principles pull in different directions, the former toward the inclusion of evidence and the latter toward the exclusion of evidence, they are both very much entrenched within our evidential procedures. In this section I shall explore what these principles are and how they are manifest within our law of evidence.

The requirement of total evidence is a venerable epistemic principle of evidence evaluation. It reflects the notion that, if one's interest rests with the acquisition of true

beliefs, one should "fix his beliefs or subjective probabilities in accordance with the total evidence in his possession at the time."[47] Of course, with inquiry we are interested in the acquisition of evidence as well as the consideration of evidence. Goldman thus formulates a stronger version of the principle that speaks to the acquisition of evidence by requiring the agent to gather all of the evidence that can reasonably be acquired and utilized in the formulation of beliefs. It is this sort of principle that applies in respect of legal inquiry where evidence is gathered and placed before a trier of fact for consideration. In our legal context, however, it is not the fact-finding agent that collects the evidence that will be considered. The parties to the dispute are generally responsible for gathering and presenting the evidence that the trier of fact will utilize and it is the trier of law (the judge) that determines whether this evidence is admissible for consideration by the trier of fact.[48] Goldman formulates a control version of the requirement of total evidence (C-RTE) to reflect situations where one agent is in a position to control the evidence that a fact-finder will have available for consideration:

> (C-RTE) If agent *X* is going to make a doxastic decision concerning question *Q*, and agent *Y* has control over the evidence that is provided to *X*, then, from a purely epistemic point of view, *Y* should make available to *X* all of the evidence relevant to *Q* which is (at negligible cost) within *Y*'s control.[49]

The structuring of C-RTE patterns the situation that we find in the law. The fact-finder takes the position of agent *X*, with the responsibility of rendering determinations of fact,

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[47] Goldman (1991), at p.113. Goldman notes that the principle underlies J.S. Mill's argument for the freedom of speech from Chapter 2 of *On Liberty* (p. 114) and attributes formulations of the principle to Rudolf Carnap and Carl Hempel.

[48] In our system trial judges may render factual findings as a matter of judicial notice. Trial judges also have a limited discretion to independently call and question witnesses; see, for example, *R.* v. *Finta* (1994) 88 C.C.C. (3d) 417 (S.C.C.), at 530.

[49] *Ibid.*, at p. 114. Goldman's formulation of this epistemic principle is, of course, a general philosophical principle that underwrites our law of evidence. In actual evidentiary law there will be exceptions.

question *Q*, with respect to the matter at dispute. The trier of law takes the position of agent *Y*, as it is the trier of law that must determine the admissibility of evidence that the parties to the dispute wish to place before the fact-finder.

The principle of C-RTE does more than pattern the structure of the presentation of evidence to a legal fact-finder. The principle also states a rule that the controlling agent should utilize in his control of the evidence that goes before the fact-finder. We are told that the controlling agent should make available to the fact-finder *all* of the evidence *relevant* to the matter at issue. This sets a standard that is inclusive of a wide variety of potential evidence. We find this standard reflected in the most basic rule of evidence, that of legal relevance. Here are two formulations of the rule:

> Relevance as explained in these authorities requires a determination of whether as a matter of human experience and logic the existence of "Fact A" makes the existence or non-existence of "Fact B" more probable than it would be without the existence of "Fact A". If it does then "Fact A" is relevant to "Fact B". As long as "Fact B" is itself a material Fact in issue or is relevant to a material fact in issue in the litigation then "Fact A" is relevant and prima facie admissible.[50]

> "Relevant evidence" is defined as that which has "any tendency to make the existence of any fact that is of consequence to the determination of the action more probable or less probable than it would be without the evidence."[51]

The first of these passages is representative of the Canadian common law rules of evidence and the second expresses that statutory rule of legal relevance that is to be found in the U.S. Federal Rules of Evidence. While the formulations are worded differently they both express the same underlying notion. Evidence is admissible before a court if it is

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Otherwise relevant evidence will, for example, be inadmissible if it is found to be a matter of a privilege such as solicitor-client privilege.

[50] *R.* v. *Watson* (1996), 108 C.C.C. (3d) 310 (Ont. C.A.) at pp. 323-324. See also, *R.* v. *Corbett* (1988), 41 C.C.C. (3d) 385 (S.C.C.), at pp. 416-418.

[51] *Daubert* v. *Merrell Dow Pharmaceuticals, Inc.*, 113 S. Ct. 2786 (1993), at p. 2794. The U.S. Supreme Court is quoting Rule 401 of the U.S. Federal Rules of Evidence. For a comparable statement in Canadian Law see, *R.* v. *Watson* (1996), 108 C.C.C. (3rd) 310 (Ont. C.A.), at pp. 323-324.

relevant in the sense that acceptance of the evidence by the trier of fact would tend to make some fact related to the trial more or less likely, thereby permitting an inference to that effect, than would be the case without the evidence. As the U.S. Supreme Court goes on to observe, this rule of relevance sets a very "liberal" standard for the admissibility of evidence - a standard that reflects the epistemic rationale embodied in C-RTE.

Richard Lempert provides a model of the rule of legal relevancy utilizing Bayes Theorem that Goldman introduces to situate the second epistemic principle, epistemic paternalism, that is of concern here. I should note that there is debate concerning the appropriateness of cashing out concepts such as relevancy in terms of the probability of inferences although this debate is not one, which I need to resolve for my purpose here.[52] The usefulness of this model for Goldman's purpose, and my own, is that it serves to illustrate a difficulty that prompts the principle of epistemic paternalism. What is of interest to us here is how an agent reasons from evidence to a determination of fact. Bayesian reasoning provides a normative account of how agents ought to reason from evidence and situating the notion of relevance in terms of Lempert's model does provide a clear and convenient illustration, in Bayesian terms, of how agent fact-finder error can occur in the legal context. Bayes Theorem is a rule of statistical reasoning.[53] Lempert

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[52] The debate over whether evidentiary law can be mathematically modelled, and the role of statistical theories of inference in understanding legal inferences, has a considerable pedigree going back to the systematizers of evidentiary law. In more recent times the academic debate can likely be traced to Finklestein and Fairley's commentary (1970) on *People* v. *Collins*, 68 Cal. 2d 319 (1968), and Laurence Tribe's (1971) influential rebuttal in his article, "Trial by Mathematics." The debate is ongoing. For contemporary arguments, both for and against mathematical modelling, see, Cohen (1977), Tillers and Green (1988) and Walton (2002).

[53] The formulation of Bayes' Theorem that Lempert employs is as follows:

$$P(G/E) = \frac{P(E/G)}{P(E/G) \bullet P(G) + P(E/notG) \bullet P(notG)} \bullet P(G)$$

derives the following formula from the Theorem for application as a model of the relevance rule:

$$O(G / E) = \frac{P(E / G)}{P(E / notG)} \bullet O(G)$$ [54]

In this formula *E* represents a new item of evidence and how its introduction would influence the fact finder's estimate of the probability that a defendant is guilty (G).[55] The odds of guilt (O) given the new evidence will equal the probability that: (1) the evidence would be presented to the jury if the defendant is in fact guilty, divided by (2) the probability that the evidence would be presented to the jury if the defendant is not guilty, and then multiplied by (3) the prior odds of the defendant's guilt. The prior odds in this instance would be the fact finder's subjective assessment of guilt at various stages of the trial. Lempert argues that logically irrelevant evidence will be evidence wherein the ratio between (1) and (2), the "likelihood ratio," is 1:1 or close thereto. Legally relevant evidence, on this model, would be evidence where the likelihood ratio departs from 1:1.[56]

Suppose that the evidence that is to be introduced to the fact-finder is legally relevant in the sense outlined above, but that the nature of the evidence is such that the fact finder is prone to misestimate the probabilities comprising the likelihood ratio. Misassigning weights can, in these instances, skew the resulting probabilities in ways that render the evidence more probable than it actually is (overestimating the numerator or underestimating the denominator), or less probable than it actually is (underestimating the

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Lempert defines O(G), or odds of guilt, in his reformulation as P(G)/P(notG). See Lempert (1977), at p. 1023.

[54] Lempert (1977), at p. 1023. See also Goldman (1991), at pp. 116-117.

[55] Lempert notes that one could just as easily substitute any term of legal determination for *G* here; e.g. *L* for liable, *N* for negligent or *M* for any matter in issue. *Ibid.*, at footnote 13.

numerator or overestimating the denominator).[57] Goldman illustrates the effect with a simple example:

> [S]uppose that in an actual assault case it can be shown that the defendant is a heroin addict, and also that one out of 500 criminal assailants are heroin addicts, whereas of the people who never engage in criminal assault only one in 1000 are heroin addicts. Then knowledge that the defendant is an addict should result in a doubling of the prior odds that the defendant was the assailant. Suppose further that the fact finder (mistakenly) thinks that the probability that a nonassailant would be a heroin addict was one in 10000 rather than one in 1000. This misestimation of the denominator by a factor of ten leads to a twentyfold increase in the odds of guilt rather than a twofold increase.[58]

In the context of a trial, with many pieces of evidence figuring into the determination, and a period of deliberation by a panel of fact-finders (the jury), the effect of this sort of misestimation is hopefully minimized. Suppose, however, that particular categories of evidence can be demonstrated to consistently mislead most cognizers in the manner articulated. In such instances the inclusion of these categories of evidence would, contrary to the assumptions of C-RTE, actually impair the truth-seeking goal of legal inquiry.

The second sort of epistemic principle that informs the law of evidence, that of epistemic paternalism, reflects the concern that particular categories of evidence may, if presented to a fact-finder, actually impair the truth seeking function of legal inquiry. Goldman states the problem and the principled remedy as thus,

> Jurors may have flaws in their background beliefs, or in their ability to draw apt conclusions from evidence. If so, the courts are prepared to protect them against these information -processing deficiencies in order to get truthful judgments on the issues at hand.[59]

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[56] *Ibid.*, at pp. 1025-1026.
[57] Goldman (1991), at p. 117.
[58] *Ibid.*
[59] *Ibid.*, at p. 118.

The principle of epistemic paternalism reflects the idea that where such a category of evidence has been identified as being of the sort that likely will, owing to fact-finder "background beliefs" or "inability to draw apt conclusions" from such evidence, impair the fact-finder's assessment such evidence should be excluded from the fact finder's consideration. Applied to legal inquiry, where a controlling agent is responsible for determinations of what evidence shall be considered at trial, the principle enjoins the controlling agent to exclude these categories of evidence.

Epistemic paternalism is well represented within our law of evidence and we can find the epistemic rationale that it embodies reflected in many common exclusionary rules of evidence. Consider, for example, the following two rules of evidence: the rule that evidence is inadmissible where its prejudicial effect outweighs its probative value and the hearsay rule. The Supreme Court of Canada explains the rule and the rationale for the first of these:

> [T]he problem which arises is that a trial is a complex affair, raising many different issues. Relevance must be determined not in a vacuum, but in relation to some issue in the trial. Evidence which may be relevant to one issue may be irrelevant to another issue. What is worse, it may actually mislead the trier of fact on the second issue. Thus, the same piece of evidence may have value to the trial process but bring with it the danger that it may prejudice the fact-finding process on another issue.
>
> The law of evidence deals with this problem by giving the trial judge the task of balancing the value of the evidence against its potential prejudice. Virtually all common law jurisdictions recognize a power in the trial judge to exclude evidence on the basis that its probative value is outweighed by the prejudice which may flow from it.[60]

The paternalistic rationale is paradigmatically exhibited in this general rule of evidence. The rule accords the trial judge the discretion to exclude *any* otherwise relevant evidence where the judge makes a determination that the evidence is apt to "mislead the trier of fact." The hearsay rule provides another good example of an exclusionary rule with an

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[60] *R.* v. *Seaboyer* (1991), 66 C.C.C. (3d) 321 (S.C.C.), at p. 390.

epistemically paternalistic rationale. Hearsay is "[A]n assertion other than the one made by a person while giving oral evidence in the proceedings" that is presented as evidence of the truth of the contents of the assertion.[61] Such evidence may well be legally relevant to a proceeding yet, with exceptions for hearsay evidence that is both reliable and necessary, courts reject such evidence. The rationale for rejecting such evidence is that, "The truthfulness and accuracy of the person whose words are spoken to by another witness cannot be tested by cross-examination, and the light which his demeanor would throw on his testimony is lost."[62] Hearsay is an everyday source of evidence that we frequently rely upon in ordinary circumstances. In our legal context, however, we demand a heightened sense of epistemic responsibility (as we shall see further in Chapter 2) and require that testimony be open to challenge through cross-examination. This is not available in the case of the hearsay statement. The paternalistic concern of the court is thus that ordinary lay jurors may be apt to accord the hearsay evidence a weight that it does not deserve owing to the unavailability of the opportunity to test the evidence through cross-examination.

1.3 The Problem of Scientific Testimony

Science plays an ever-increasing role in our society. It should come as no great surprise then, that science is also emerging to play a role, through the testimony of experts, in our legal system. A review of the use, or attempted use, of science in some of

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[61] *R.* v. *Kearley* [1992] 2 All E.R. 345 (H.L.).
[62] *Ibid.*

the cases that will figure in later discussion begins to disclose the breadth of applications that science has in the courtroom. We shall find:

- polygraph evidence purporting to show the veracity of a witness;

- voiceprint identification purporting to show that a recorded voice is a given individual;

- DNA evidence purporting to show that it is probable that some sample of physical evidence found at a crime scene belongs to a particular individual;

- "anal gaping" evidence purporting to show that certain physical phenomena are indicative of anal intercourse;

- epidemiological studies purporting to show a causal connection between a common pharmaceutical product and certain birth defects;

- penile plethysmography evidence purporting to show that a given individual does not fit a pattern associated with a distinct form of deviant sexual behavior;

- sociological evidence purporting to show a connection between psychological harm and the attendance of segregated schools;

- psychological evidence purporting to show that a given individual stands a 100% likelihood of re-offending.

Science impresses us even as it mystifies (and perhaps scares) us. We are impressed by the achievements of science and there can be little doubt that science affords us one of the most powerful tools of knowledge acquisition in the human cognitive arsenal. This renders science a useful and often highly probative tool within legal inquiry. The fact remains, however, that most of us are relatively illiterate scientifically and hence prone to difficulties in evaluating science. Impressed with the success of science we may tend to lend credence to scientific testimony based primarily on a deference to epistemic authority coupled with the myth of scientific infallibility. We may also wrongly interpret

or discount science where we are confused by it, frustrated, or frightened by it.[63] Both of these tendencies can stimulate difficulties for the consideration of scientific evidence by the trier of fact.

There are three problems that I wish to articulate, pre-theoretically, that can arise from the intersection of legal fact-finding and the courtroom use of science. To introduce these problems I will utilize three examples drawn from actual cases. The cases chosen present a series of concerns that stand at the intersection of law and science; whether these concerns stem from an actual problem, and if so what the nature of that problem is, I shall explore further in Chapters 2 and 3. For the moment, however, let's examine the shape of the three concerns presented.

The first case I wish to consider is that of *Barefoot* v. *Estelle*.[64] In this case the prosecution, having convicted Barefoot, was seeking the death penalty under Texas' death penalty statute. A qualifying factor for execution under this statute was evidence presented before the sentencing jury, that the convicted party was likely to be dangerous in the future. The prosecution called an expert psychiatric witness who, having never examined Barefoot, testified that Barefoot stood a "one hundred percent and absolute chance" of committing future acts of violence. Anyone with the least bit of acquaintance with the nature of scientific confirmation and prediction, much less those of psychiatry, will know that certitude is a degree predictive capability that just is not in the deck. On appeal to the United States Supreme Court the American Psychiatric Association presented an *amicus* brief noting that a "large body of research in this area indicates that,

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[63] See Collins and Pinch (1993), at p. 142 for a discussion of how common myths about science impact lay perceptions of science.

even under the best conditions, psychiatric predictions of long-term future dangerousness are wrong in at least two out of every three cases."[65] The 'science' presented here was, at least in the opinion of the A.P.A., far from reliable. It was, moreover, presented to a jury unacquainted with science, through an expert who, through arrogance, deception, or incompetence, was willing to present the prediction in terms of certitude.[66] Unable to assess the merits of the opinion for themselves, and perhaps impressed by the apparent "good credentials" of the "expert," this highly unreliable and inflammatory evidence went before the jury for consideration - upon this evidence, Barefoot eventually went to his death. My first concern is thus that unreliable scientific evidence may go before a trier of fact that, owing to the trier of fact's inability to adequately assess the merits of that evidence, may result in the evidence being accorded far more weight than it properly deserves.

The second case I wish to consider is that of the notorious O.J. Simpson murder trial. In this case the prosecution presented much powerful forensic evidence including

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[64] *Barefoot* v. *Estelle,* 463 U.S. 880 (1983).

[65] Gianelli (1993), at p. 113. Some comparable issues arise in Canada over the use of psychiatric evidence pertaining to 'dangerousness' under the dangerous offender provisions of the *Criminal Code*. In *Lyons* v. *The Queen* the Supreme Court of Canada considered the constitutionality of these provisions. The appellant argued, among other things, that s.690 of the *Code*, by requiring psychiatric evidence as to dangerousness, was unfair to the extent that such evidence is notoriously unreliable. The Supreme Court rejected this argument noting that while there are limitations as to the reliability of this sort of evidence it is, nevertheless, relevant to the issue of whether an individual is likely to behave in a certain way in the future and that such evidence was a good deal more reliable than any other evidence available on the matter at issue. Both the Court, and the psychiatric experts that the Crown relied upon, were clear about the predictive limitations of this evidence. See, *Lyons* v. *The Queen* (1987), 37 C.C.C. (3rd) 1 (S.C.C.), at pp. 47-49. The *Lyons* decision pre-dates the more recent decision of the Supreme Court in *R* v. J.-*L.J.* (see Chapter 4) by thirteen years and one must wonder how well the *Lyons* decision squares with the emphasis placed upon reliability as a condition for the admissibility of scientific testimony in the later decision.

[66] There is good reason to suspect that the expert in question, a Dr. Grigson, was a prosecution 'hired gun' whose interest was less with his science and more with ensuring executions for the prosecution. Ron Rosenbaum, who wrote on Grigson, reports that as of May 1990, "juries had returned death penalties in 118 of the 127 cases" in which the Doctor testified. The Doctor reportedly "revels in selling his views to the jury and setting traps for defense counsel." See Gianelli (1993), at p. 115.

DNA evidence. The DNA evidence in the trial was highly complex, requiring weeks of testimony, yet highly persuasive from an objective standpoint.[67] Interestingly, the defence elected to focus its trial strategy on the contention that Simpson was the target of a conspiracy, with significant racial overtones, conducted by members of the Los Angeles Police Department. On a rational assessment, however, the set of improbable propositions that one must believe to raise doubt on the basis of the conspiracy theory begins to render the theory about as probable as the infamous "magic bullet theory." Why, then, did the jury acquit in the face of the prosecution's scientific evidence? The prosecution in the Simpson case failed to effectively convey to the jury the sheer improbability of what the defence was attempting to persuade them to accept.[68] Post-trial interviews also disclosed that many jurors simply did not understand the scientific evidence, or were incapable of assessing the defence's attempt to suggest irregularities in the procedures employed by the prosecution's forensic experts. One must also note that, with the mostly black Los Angeles jury, the notion of a conspiracy by the Los Angeles Police Department against a high profile black man resonated with the more general black experience of racism.[69] So, in this scenario, the jury's background beliefs and lack of understanding meant that proper weight was not accorded to the scientific evidence and too much weight was accorded to an explanation, in the form of the conspiracy theory, that was much more accessible to their experience.

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[67] I can recall one of my law teachers, Jack Watson Q.C. (at the time, one of the Province of Alberta's most respected prosecutors), referring to the evidence possessed by the prosecution in the Simpson trial as a "slam dunk" for the prosecution.

[68] Bugliosi (1996), at pp. 159-162. For example, whereas the defence devoted most of its time in closing argument to pushing home the conspiracy theory (and making the most of their examination of detective Fuhrman), the prosecution effectively elected not to deal with the issue by superficially dismissing it in a few brief comments.

The final case is the *Hopkins* v. *Dow Corning Corporation*[70] decision in which Mariann Hopkins successfully sued Dow Corning, alleging that the silicone breast implants manufactured by the corporation caused her mixed connective tissue disease. Like the Simpson case, this was a case in which the jury did not accord proper weight to the reliable science that was before the jury. Unlike the Simpson case, however, the *Hopkins* decision reflects a scenario wherein contesting scientific opinions are before the court: the plaintiff's experts contending that there was a causal connection between silicone implants and MCTD, and the defendant corporation's experts denying any evidence of a causal connection. The basis for the opinions of the plaintiff's three experts, novel studies and preliminary epidemiological studies, was suggestive of an association between the implants and the plaintiff's disease. The great weight of toxicological and epidemiological evidence available at the time, however, disclosed no causal connection.[71] The jury accepted the testimony of the plaintiff's experts and awarded the plaintiff nearly $7.5 million in compensatory and punitive damages. This, then, is a case that illustrates the difficulty that can arise when the background beliefs of laypersons render them poorly prepared to assess the claims of competing scientific claims in litigation.

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[69] *Ibid.*, at p. 253.

[70] *Hopkins* v. *Dow Corning Corporation*, 33 F.3d 1116 (9th cir. 1994).

1.4 Topography of Legal Responses

If we undertake an examination of attempts to craft an evidentiary treatment of scientific opinion evidence, in both case law and legal literature, we discover three broad sorts of response to the problem articulated in Section 1.3. The analysis that follows in the next five chapters will examine these responses, their philosophical underpinnings, and the problems associated with them, in much greater detail. For now, let's simply lay these responses on the table and state in simple terms how each proposes to address the problem of scientific opinion evidence.

The first sort of response that I have in mind is what I term an "inclusionary approach." In Section 1.2, I argued that the epistemic principle known as the requirement of total evidence underlies our most basic rule of evidence, that of legal relevance. In our system of law the parties to the dispute present evidence, primarily in the form of witness testimony, for examination before a trier of fact (jury or judge) and it is from this process that the trier of fact must come to form a justified true belief concerning the facts of the dispute. According to C-RTE, all evidence that is legally relevant, and which can be put forward with reasonable cost, should be placed before the trier of fact's consideration. How is the problem of scientific testimony, raised in Section 1.3, purportedly addressed under this "liberal" approach to evidence? This, the proponent of such an approach will argue, is the task of the adversary system. Through vigorous cross-examination by opposing counsel, the presentation of contrary evidence, and instruction on the burden of proof by the trial judge, it is supposed that the trial process shall provide the trier of fact

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[71] See, for example, Lawson (1996) for a summary of the science and the law following the *Hopkins* award. Toxicological and epidemiological inquiry has yet to disclose a causal connection between silicone

with the basis for rendering determinations of whether the scientific opinion evidence presented should be relied upon. In other words, this approach recommends that no adjustment to our evidentiary procedure is necessary to address the problem of scientific testimony.

Suppose upon reflection, however, that we find reason to doubt whether the inclusionary approach can resolve the epistemic difficulties identified in Section 1.3. The law of evidence, as I argued in Section 1.2, also embodies rules and procedures that reflect epistemically paternalistic principles. An approach that provides a mechanism for excluding otherwise legally relevant evidence on the grounds that such evidence is apt to be injurious to the epistemic goals of the legal fact finder is what I shall call an exclusionary approach. The second form of legal response that I will explore in this work is the most common form of an exclusionary approach that we find applied to the problem of scientific testimony. It consists of the formulation of an exclusionary rule of evidence that a trier of law will apply to 'screen out' scientific testimony that could be damaging to the fact finder's epistemic goal. This would consist in some form of criteria, a legal test or tests that the trier of law would apply in order to evaluate whether the putative testimony is reliable from an evidentiary standpoint. As we shall see in Chapters 4 and 5, this approach attempts to alleviate the problems identified in Section 1.3 by ensuring that only science that meets a specified threshold of evidentiary reliability will go before a legal fact-finder.

The formulation of an exclusionary rule is a fairly commonplace legal response to concerns over fact-finder competence to evaluate some types of evidence. In the case of

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implants and MCTD.

scientific testimony, however, the approach presents numerous notorious difficulties. How does one formulate a test for distinguishing 'good' or reliable science from 'junk' science? How does one do so in a manner that can be employed by a party - a judge - that in all likelihood lacks scientific expertise? Added to these concerns we might also wonder whether an exclusionary rule really does respond to the concerns of Section 1.3. Even if a satisfactory exclusionary rule could be developed we might still question whether science that does meet such criteria could be adequately assessed by a trier of fact in the context of an adversary proceeding. Commentators like Langbein and Goldman suggest that the adversarial model, employed before a lay jury, provides a poor venue for the evaluation of science. The experience of the continental system of law is often the prime motivator for those possessing this concern. Such commentators, impressed with the ostensible advantages that the continental system has with respect to scientific testimony, offer another form of an exclusionary approach. I shall characterize responses that take this form as non-adversarial approaches.

Non-adversarial approaches respond to the two sorts of concern identified above, the difficulties with exclusionary rules and the concerns over the adversary system, by procedurally detaching the evaluation of science from the legal system. In the case of the concern over exclusionary rules this may take the form of introducing court appointed scientific experts to determine scientific reliability and, thereby, admissibility. With respect to concerns over science in an adversarial setting, proponents of this approach will recommend such things as adopting aspects of continental civil procedure for the

treatment of scientific testimony.[72] These suggestions, of course, need not be combined. The overall aim of this response is the same as that underlying an exclusionary rule approach: to shield the trier of fact from testimony that is apt to impair the fact finder's epistemic task. Where this approach differs from an exclusionary rule approach is in its skepticism concerning the ability of the legal system in its present form to adequately achieve this goal and the willingness to introduce extra-legal means into the process to remedy the situation.

The topography of this issue from a legal standpoint thus discloses three very different approaches. First, we have an inclusionary approach that relies upon the adversary system to provide the trier of fact with the resources needed to make determinations concerning the merits of science presented at trial. Secondly, we have an approach that is skeptical about the ability of the adversary system to deal with all instances of scientific testimony and which recommends the use of exclusionary rules by the trier of law to screen out science that does not meet a specified threshold of evidentiary reliability. Finally, we have an approach that is skeptical about the ability of either approach to adequately deal with the challenge posed by scientific testimony, and which proposes to ameliorate the difficulties arising from the use of science at trial through the employment of extra-legal procedures.

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[72] See, for example, Langbein (1985) and Goldman (1999).

Chapter 2 – Testimonial Justification

Three sorts of concerns associated with the courtroom use of scientific testimony were pre-theoretically articulated in Chapter 1, together with candidate forms of legal response. Trier of fact (the knower in this instance) knowledge founded upon expert scientific opinion evidence delivered in court is a species of testimonial knowledge. This is knowledge that has the form, *S* knows that *p* because *R* reported to *S* that *p*. If we wish to understand the dynamics of the concerns articulated in Chapter 1 in order to ameliorate these problems, we must first inquire into the mechanics of testimonial justification. The burden of this chapter will thus be that of constructing a defensible account of the justification of testimonial beliefs suitable for application to the courtroom context.

2.1 The Nature of Testimonial Evidence

The standard epistemological understanding of knowledge holds that a belief will constitute knowledge when the belief is justified – or warranted – and true. Leaving the nature of justification undeveloped for the moment, there are three broad stances that one could adopt concerning the epistemic status of testimonial beliefs given the standard account of knowledge. If we find that testimony can never provide a justified belief that *p* under our account then we have a counsel of despair and the first possible epistemic stance toward testimony: skepticism. I will assume that a satisfactory account of the justification of testimonial beliefs should not result in widespread skepticism concerning the epistemic status of such beliefs. Scholars representing diverging perspectives on the epistemology of testimony agree that much of what passes for knowledge rests upon

testimony.[1] To endorse an account of testimonial knowledge that results in widespread skepticism would therefore be to decimate our ability to acquire true beliefs. This requirement trades upon a consequentialist picture of knowledge in the sense articulated by Schmitt: "justified beliefs are those sanctioned by that feasible system of evaluation which, in the course of its promotion and satisfaction, would best (among the feasible systems) serve epistemic goals."[2] The reader will readily note that it may seem as though this assumption unjustifiably discounts the possibility of skepticism. I do not mean this to be the case at all. Rather, I mean simply to acknowledge our common pre-theoretic intuition that testimony is a basis for knowledge and require the entertaining of skepticism only in the event of an abject failure of non-skeptical accounts.

There are two positive characterizations of the nature of testimonial knowledge extant within contemporary literature. Adopting the first of these renders the second broad epistemic stance. This holds that testimonial beliefs can provide justification, but that this justification must reduce to other "more fundamental" forms of evidence available to the knower; for example, one's own empirical evidence.[3] Following the literature I will refer to this as the *Reductionist Thesis* of testimonial knowledge.[4] There is also a third epistemic stance emerging in the literature holding that testimonial beliefs can

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[1] See for example, Hume (1977), at p. 74, Fricker (1987), at pp.57-58 and Coady (1992), at pp. 6-13.

[2] Schmitt (1987), at p. 59. The epistemic goals that Schmitt has in mind here are the "old-fashioned" ones: "acquiring true beliefs, deleting false beliefs, and abstaining from acquiring false beliefs and from deleting true beliefs." See also Goldman (1986) at pp. 97-103.

[3] Coady (1992), at p. 22.

[4] Coady notes that the term "reductionism" is not to be understood in a technical sense here, but rather as a label for a class of accounts that regard testimony as a non-primary form of evidence. Any viable epistemology of testimony will involve inferential links of some sort (e.g. deductive, inferences concerning coherence or the lack of it, probabilistic inferences). What distinguishes the non-reductionist thesis is simply the claim that the knower must possess some confirming evidence of his own that would,

provide justification but denying the reductionist contention that such a justification requires the knower to possess his own evidence that would independently serve to justify the testimonial belief. This thesis, in effect, claims that testimony is a fundamental, or primary, category of evidence as opposed to the reductionist claim that testimony is a parasitic or secondary sort of epistemic connection. This sort of position has come to be known as the *Non-Reductionist* thesis.

2.2 The Reductionist Thesis

Hume provides a formulation of testimonial knowledge in his discussion of miracles within *An Enquiry Concerning Human Understanding*.[5] Coady, in his pioneering contemporary study of testimony, characterizes Hume's account as paradigmatically reductionist. Not surprisingly, the primary evidential form that Hume wishes to reduce testimony to is that of the knower's individual observations of the reporter's veracity concerning the matters reported. The key passage on testimony within the *Enquiry* states:

> [W]e may observe, that there is no species of reasoning more common, more useful, and even necessary to human life, than that which is derived from the testimony of men, and the reports of eye-witnesses and spectators. This species of reasoning, perhaps, one may deny to be founded on the relation of cause and effect. I shall not dispute about a word. *It will be sufficient to observe, that our assurance in any argument of this kind is derived from no other principle than our observation of the veracity of human testimony, and of the usual conformity to facts and reports of witnesses.* It being a general maxim, that no objects have discoverable connexion together, and that all of the inferences, which we can draw from one to another, are founded merely on the experience of their constant and regular conjunction; it is evident, that we ought not to make an exception to this maxim

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independent of the testimonial report, justify the testimonial belief that *p*. Coady attributes the label "reductionism" to J.L. Mackie. See, Coady (1992), at p. 22-23.

[5] Coady describes Hume's account of testimony as the "received view" on the matter. I shall be utilizing Coady's interpretation of Hume to characterize the reductionist position but it is worth noting that Coady's interpretation of Hume is the subject of some debate. Paul Faulkner, for example, provides a useful critique of this interpretation of Hume; see Faulkner (1998) at pp. 303-305.

> in favor of human testimony, whose connexion with any event seems, in itself as little necessary as any other.[6]

The justification for beliefs founded upon testimony is empirical under the Humean account. We are told that the tribunal of experience reveals testimony to be a reliable source of knowledge. Let us probe this claim to reliability further. What experience does Hume have in mind here? On Coady's interpretation of Hume there are two arguments embedded within the passage (the portions italicized). Testimony is generally reliable because of:

(i) *our* observation of the veracity of human testimony; and,

(ii) the usual conformity to facts and reports of witnesses.

Under the first line of argument testimony is reliable because the common experience of humanity reveals it so. The appeal of this argument is therefore to an ostensible "communal observation" rather than to the particular observation or experience of any given individual - a feature which renders this line of argument peculiar as a reductive account of testimony.[7] Any one of us is presumably entitled to regard testimony as justified since so many of us have had the experience of discovering testimony to be generally reliable. Coady faults this argument with vicious circularity since taking seriously others' reports of the reliability of testimony assumes what the argument is trying to establish: the reliability of testimony.

The second line of argument does explicitly invoke individual experience. Here Hume is arguing that an individual knower is justified in relying upon testimony if this

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[6] Hume (1977), at p. 74. My emphasis.

[7] Coady (1973) at p. 150. Coady's "Testimony and Observation" appears, with some further argument, in chapter 4 of Coady (1992). Interestingly, Hume's argument concerning the general veracity of testimony could serve as the basis for a *non-reductive externalist* account of testimony: see section 2.4.

knower has observed for himself a "constant and regular conjunction" between the sorts of things and situations reported by the source.[8] A simple example will help to illustrate this point. Suppose that I am at the café awaiting my friend Jimmy for a game of chess. Jimmy arrives and reports that it is presently raining outside. I then gaze outside and see that it is in fact raining. In this case I have personally observed a conjunction between Jimmy's report and the situation reported. Sight is a primary epistemic link and it is my observation of 'rain now' accompanying Jimmy's report that justifies future testimonial beliefs founded on Jimmy's reports that 'it is now raining.'

What's wrong with the reductionist account? The reductionist interpretation of Hume's argument, the one that holds *S* knows that *p* on the basis of *R*'s report if and only if *S* possesses experience of the things and situations reported, encounters a disturbing objection. This objection is especially telling for my purposes since, if true, it runs the reductionist program afoul of the non-scepticism requirement that I set out in section 2.1. Recall that this line of argument rests the justification of testimonial beliefs upon the knower's possession of supporting knowledge of a "primary" character: the knower's own observations. This argument encounters difficulty arising from the simple fact that most of us do not engage in anything approaching the extent of empirical checking of testimonial beliefs that this version of Hume's argument would require.[9] Reflection upon very commonplace examples of testimony provides ample illustration of this point. I wake up in the morning to read a newspaper report regarding the government's new health care reform legislation. I then walk to my office after checking the local weather

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[8] Coady (1973) at p. 151.

[9] *Ibid.*, at p. 151.

forecast on the television weather channel. On my way to the office I encounter a friend who tells me who chance favoured at the poker game that I missed attending on the weekend. Arriving at my office I look at my day-timer and see that I must obtain birthday gifts for my father and girlfriend. Later that day I attend a lecture in the history department where the lecturer reports the findings of his research on land use in the colonial economy of New France in the late seventeenth century. All of these events involve testimonial reports that provide me with evidence as to the truth of various propositions; evidence that I and most everybody else will accept as a basis for knowledge. In all of these commonplace instances, however, I am rarely in possession of anything like Humean justification since I have no observations of my own that would either confirm or deny any of the above reports. How impoverished our ability to acquire true beliefs would be if testimonial justification required this sort of reduction!

The complaint that we do not engage in Humean-like justifications of testimonial knowledge is more devastating when one proceeds from reflection upon commonplace instances of testimony to the sphere of expert testimony. Consider the sort of expert scientific knowledge that is of interest within this project. The challenge in this case arises from the lack of competence of non-experts in evaluating expert knowledge and, expanding this somewhat, the cooperative nature of contemporary scientific inquiry. Consider first the problem associated with non-expert evaluation of expert knowledge. Schmitt poses the conundrum in the following case where one seeks a Humean justification of the testimony of one's immunologist:

> Suppose I find someone, *T*, who testifies to the reliability of my immunologist *S*. I have to check *T*'s reliability in checking the reliability of sources of type [*S*] (say, immunologists) on the relevant topic (immunology). To check *T*'s reliability, on the

> Humean view, I must check it against my observations – which means first listing his assessments of the reliability of [*S*]s, and then checking to see whether these assessments match the actual reliability of [*S*]s. The latter check involves calculating the [*S*]s' reliability against my own observations of the truth-values of their pronouncements on the topic. But I can justifiably make such a calculation only if I am myself competent in immunology. Since I am not an expert on the topic, I cannot make the sort of check the Humean account requires.[10]

Because 'expert knowledge' is by definition outside of the knowledge and experience of the layperson, reductionist strategies will immediately encounter difficulty in presenting such knowledge as justifiable for the layperson. Without having the wherewithal to individually check the pronouncements of the expert, a task that on the Humean account requires the layperson to possess the very expert knowledge that he is lacking, it seems impossible to contend that a layperson could ever form a justified belief on the basis of expert testimony (scientific or otherwise).

The problems for the reductionist account do not, however, cease merely with justifying expert knowledge to laypersons. Scientific inquiry, as well as other truth-seeking fields that exhibit intense specialization, discloses a division of cognitive labour. That is, participants in the production of scientific output (research disclosing scientifically established facts) rely intensively upon the work of others. We can identify a number of cognitively dependent relationships here. A non-exhaustive list would include:

- Researchers relying upon the observations of technicians;

- Researchers relying upon the experimental work of other researchers with the same specialization;

- Researchers relying upon the experimental work of other researchers with differing specializations.

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[10] Schmitt (1987), at p. 49. Schmitt goes on to consider various reductionist rejoinders – all of which raise comparable problems; see pp. 49-53.

The pioneering work of Latour and Woolgar vividly illustrates this division of cognitive labour.[11] The authors turned anthropological techniques to a study of the Salk Institute for Biological Studies. We find a varied division of labour – both cognitive and physical:

1. Service support staff;
2. Administrative staff;
3. Technicians responsible for mundane tasks or observations;
4. Technicians responsible for complete "processes" – such as conducting radioimmunoassays;
5. "Super-techs" that possess Ph.D.s but carry out technician-type tasks for other researchers;
6. Ph.D. holders whose intellectual labour motivates the research and who generate published findings.[12]

The study reveals that researchers rely – for example, in the conducting of an immunoassay – upon the observations and "routinised skills" of individual technicians.[13] Latour and Woolgar also note that the development of new technical equipment, and reliance upon the knowledge of those fields relevant to this development, is also crucial to the scientific process.[14] Finally, we may also observe from the study the role that the publication of findings by other researchers – and reliance upon those findings – plays in stimulating research and new findings.[15] The benefits of this division of cognitive labour should be apparent. Through this division the scientific community attains an efficient, rapid and reliable acquisition of many facts.[16] Scientific knowledge rests squarely upon

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[11] While the work of Latour and Woolgar provides much insight into the actual practice of the modern laboratory I do not mean to endorse the social constructivist conclusions that they draw from their research.

[12] Latour and Woolgar (1986) at pp. 216-230. See also Latour and Woolgar (1986), Chapter 2 generally.

[13] *Ibid.*, at p. 65.

[14] *Ibid.*, at pp. 63-68.

[15] *Ibid.*, at pp. 81-86.

[16] Efficiency arises since to require a researcher to exhibit expertise on all elements relevant to his inquiry would demand far more training and cognitive labour – indeed it is doubtful that this degree of knowledge is even possible given the explosion of contemporary scientific knowledge. The rapidity of inquiry is enhanced through the delegation of specific problems to those with the required expertise, the delegation of relatively mundane tasks to technicians and, in a wider sense, through different teams of researchers simultaneously pursuing different approaches to the same problems. Finally, the system of peer review and publication serves to provide both incentive for scientific research and a system for the rigorous scrutiny of factual findings. See, for example, Barnes, (1985) at p. 43; Latour and Woolgar (1986) Chapter 2; and

this complex system of epistemic dependence and we would simply be naïve to deny this.

The epistemic dependency of scientific knowledge is a dependency upon the testimony of others. At this point the puzzle raised by the reductionist account for expert knowledge begins to be apparent. If knowledge founded upon testimony requires that the knower either have access to all of the justifying premises for the scientific knowledge that *p*, or if we require the truth generating processes or functions to be vested in the individual cognizer, then what are we to say in the very commonplace instance of scientific knowledge where the researcher relies upon the work of another. Further, what are we to say when the researcher in question lacks even the background knowledge to assess the reliability of the source's work himself? Hardwig elegantly expresses the problem posed by expert testimony:

> Thus, in very many cases *within* the pursuit of knowledge, there is clearly a complex network of appeals to the authority of various experts, and the resulting knowledge could not have been achieved by any one person. We then have something like the following:
>
> *A* knows that *m*.
> *B* knows that *n*.
> *C* knows (1) that *A* knows that *m*, and (2) that if *m*, then *o*.
> *D* knows (1) that *B* knows that *n*, (2) that *C* knows that *o*, and (3) that if *n* and *o*, then *p*.
> *E* knows that *D* knows that *p*.
>
> Suppose that this is the only way to know that *p* and, moreover, that no one who "knows" that *p* knows that *m*, *n*, and *o* except by knowing that others know them. Does *D* or *E* know that *p*? Does anyone know that *p*? Is that *p* known?[17]

The type of reductionist account of testimony that we find with Coady's interpretation of Hume would demand a negative answer to the questions Hardwig poses here. Hardwig uses this case of the puzzle of expertism as a *reductio ad absurdum* of the traditional individualistic assumptions of epistemology – embodied within the reductionist thesis – since presumably science provides an exemplar of truth yielding inquiry. His conclusion

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Bauer (1992) at p. 41-53.

also implicitly endorses a consequentialist approach to epistemology. Hardwig suggests that unless we are willing to accept the unpalatable negative answers to the questions he posits in the passage above, we must recast our individualistic assumptions and entertain the possibility of "knowledge that is known by the community" or knowledge "without possessing the supporting evidence."[18]

I shall consider Hardwig's suggestions in due course, but for the moment let us take stock of how the reductionist strategy fares. Problems arise, as the arguments canvassed in this section demonstrate, with the satisfaction of the non-scepticism requirement. Endorsing reductionist testimonial justification would gut testimony as a source of knowledge. This would be dramatic enough in the case of lay beliefs; in the case of specialized knowledge arising from complex divisions of cognitive labour the consequences would be devastating. Reductionist testimonial justification, I submit, is unsalutary as a defensible account of testimonial knowledge. With this conclusion in mind, let's turn and consider whether a non-reductionist strategy fares any better.

2.3 Non-Reductionism: The Group Knowledge Approach

Coady's account of testimony goes beyond a critique of reductionist strategies. He contends that testimony is, "a fundamental category of evidence which is not reducible to, or justifiable in terms of, such other basic categories as observation or deductive inference."[19] Coady provides a positive argument that seeks to establish that non-reductive testimony is a necessary condition of language use, thereby "vindicating"

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[17] Hardwig (1985), at p. 348.

[18] *Ibid.*, at p. 349.

testimony as a trustworthy source of knowledge. If the adversary concedes to this argument regarding the role of testimony within language use then he too must concede the existence of instances of justified testimonial beliefs absent anything like a reductionist justification. The notion of a non-reductive account of testimonial justification is a novel tack within contemporary epistemology. While Coady's extensive survey provides many useful criticisms of reductive strategies, as well as some interesting reasons to opt for a non-reductive epistemic link between testimony and true beliefs (his positive argument), his examination does not provide us with any answers to the question that is of interest here: what would a non-reductive justification of testimonial beliefs look like? Simply acknowledging that testimony is indispensable to our practice does not suffice for justificatory purposes.

I noted above that Hardwig gestures toward two possibilities that could assist in constructing a non-reductive justificatory account in his article "Epistemic Dependence." The first of these is a 'group knowledge' approach and the second invites us to consider the possibility of a justificatory account whereby the individual lacks the supporting evidence.[20] Both of these suggestions are promising avenues for further epistemological inquiry, but for my purposes here, it is the latter suggestion that must carry the burden. The notion of "group beliefs" and "group knowledge" is receiving greater attention in contemporary scholarship. Margaret Gilbert and Frederick Schmitt articulate the outlines of a group knowledge account that, if successful, would sustain non-reductive testimonial

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[19] Coady (1973), at p. 154.
[20] Hardwig (1985), at p. 349.

knowledge.[21] Unfortunately, even if the notion of group knowledge were adequate philosophically, it would not satisfactorily characterize the belief output that interests us in the courtroom forum.

The concern in the courtroom context is with the belief output of *an individual* trier of fact on the basis of source testimony. While this problem falls within what Goldman describes as social epistemics[22] in that the input consists of the reports [testimony] of others, the belief output that interests us in the legal context is not a group belief but rather an individual [non-social] belief. This consists of the belief that *p* of an individual trier of fact *S*, formed as a consequence of *R*'s testimony that *p*. The law of evidence is very clear on this point. It is a well-entrenched feature of our law that, even where the trier of fact consists of a plurality (as in the case of a jury), there is no requirement that jurors agree on any single fact save the ultimate conclusion. Writing in *R.* v. *Morin* our Supreme Court states,

> The argument in favour of a two-stage application of the criminal standard has superficial appeal in theory but in our respectful opinion is wrong in principle and unworkable in practice. In principle, it is wrong because the function of the standard of proof is not the weighing of individual items of evidence but the determination of ultimate issues. Furthermore, it would require the individual members of the jury to rely on the same facts in order to establish guilt. The law is clear that the members of the jury can arrive at their verdict by different routes and need not rely on the same facts.[23]

In this passage the Court is considering an argument that the standard of proof (beyond a reasonable doubt in the criminal context) should be applied in respect of individual items

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[21] See Gilbert (1987), and Schmitt (1994).

[22] Goldman (1987), at p. 131. Goldman characterizes individual epistemics as those involving basic cognitive processes and non-social belief forming methods. The distinguishing feature of social epistemics within his taxonomy is that the "*inputs* are opinions or communicational acts of other people, or the cognizer's beliefs about these." In what follows I will speak of individual non-reductive testimonial justification. In using the term "individual" the reader should not draw the conclusion that I am speaking of individual epistemics. I utilize the term "individual" in what follows to distinguish cases where the belief output is non-social from the preceding discussion of social – or group – belief output.

of evidence as well as in respect of the ultimate issue of guilt. Individual facts may be highly probative, but what matters in the legal context is the chain of facts that leads to an ultimate conclusion. If there is a group belief applicable here it rests with the joint acceptance of that ultimate conclusion. The Court's statement indicates clearly, however, that there is no requirement that individual jurors agree on particular facts in the determination of the verdict. Consequently, what we are interested in with respect to any particular piece of testimony and judicial fact-finding is how it can provide an *individually* justified belief that *p*. Since the output belief that concerns us in the law's use of testimony is non-social, the group knowledge approach to testimonial justification will not suffice.

2.4 Non-Reductionism: The Reliabilist Approach

If the notion of group knowledge provides us with no succor perhaps Hardwig's second suggestion will be more helpful. Recall that this invites us to consider solving the problem of testimonial knowledge by dispensing with the requirement that the knower possess all of the justifying premises that *p*. Contemporary accounts of justification answer to differing intuitions that divide broadly along internalist and externalist lines. Internalist justificatory accounts, best represented by the various contemporary versions of coherentism, demand subjective access by the cognizer to the justificatory basis of the belief in question. It is this traditional internalist requirement that creates the puzzling difficulty for a justificatory account of testimonial knowledge. By contrast, externalist justificatory accounts, best represented by contemporary reliabilism, locate justification

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[23] *R.* v. *Morin* (1988), 44 C.C.C. (3d) 193 (S.C.C.), at p. 210.

in the presence of actual conditions that confer justification whether or not the cognizer has subjective cognitive access to those conditions. Reliabilism would therefore seem well tailored to Hardwig's second suggestion.

The simple process reliabilist account of individual justification formulated by Goldman provides a basis for an externalist approach to non-reductive testimonial justification. Let us assume that Goldman's reliabilist account is viable. Under this scheme he invokes the following principle of justification:

> S's believing p at t is justified if and only if
> (a) S's believing p at t is permitted by a right system of J-rules, and
> (b) This permission is not undermined by S's cognitive state at t.[24]

The system of J-rules provides a truth-linked "criterion-schema" for justifiedness:

> A J-rule system R is right if and only if
> R permits certain (basic) psychological processes, and the instantiation of these processes would result in a truth ratio of beliefs that meets some specified high threshold (greater than .50).[25]

How might testimonial beliefs find justification under this framework? Hume's notion of communal observation provides a gesture toward a straightforward way of formulating testimonial justification in these reliabilist terms. Recall that under this Humean argument justification stems from, "our observation of the veracity of human testimony."[26] This account founders as a *reductive* account, given Coady's interpretation of Hume, because it depends upon first assuming that testimony is reliable - that is, that the reports of others concerning the veracity of testimony are reliable. This critique, however, implicitly relies upon an internalist conception of justification. The knower, Coady is telling us, cannot

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[24] Goldman (1986), at p. 63. A "J-rule" is a justificational rule or rules, characterized by Goldman as "a regulative conception of evaluation" whereby the rules "attempt to provide advice, decision guides, or recipes, for making doxastic choices." *Ibid.*, at p. 59. Goldman has refined his reliabilism since the publication of *Epistemology and Cognition*. For my purposes, however, this account will suffice.

[25] *Ibid.*, at p. 106.

possess a Humean "communal" justification for testimony without having subjective access to the premises that support the beliefs that provide the basis for this general claim. Suppose, however, that we construe testimony as a J-rule system under Goldman's approach. Goldman sketches what such an account would look like:

> What is required for this process to be reliable? Assuming that hearers accurately represent speakers' reports, what is further required is that those reports be generally true. So credulity achieves reliability if and only if it is exercised in an environment in which speakers' reports are generally true. If this condition is satisfied, then the (simple) reliabilist theory of justification assigns the status of "justified" to testimonial beliefs, whether or not believers have an inductive basis for regarding testifiers' reports as reliable.[27]

If testimony is a process that, as a matter of empirical fact, results in a truth ratio of beliefs that meets the threshold of reliability, then the justification of testimonial beliefs should follow on externalist grounds.

What of the merits of the empirical claim that underlies this reliabilist approach to testimonial justification? While there doubtless are many cases of unreliable or even misleading testimony, it nevertheless seems safe to concur with Hume's assessment of the "veracity of human testimony." Most of us can provide a wealth of anecdotal evidence supporting the contention that testimony tends to be more reliable than not. Certainly too, the authors considered thus far, from Hume to Coady, widely adhere to the claim that testimony is in fact a reliable form of evidence. In the absence of a more rigorous empirical study of testimonial outcomes one may nevertheless proffer arguments that support the anecdotal evidence and the reliabilist contention that testimony is, as a matter of fact, a reliable process of belief generation.[28] Goldman, for example, argues that

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[26] Hume (1977), at p. 74.

[27] Goldman (1999), at pp. 129-130.

[28] It also seems plausible to posit, as a biological 'just-so' story, that a degree of credulity was apt to be beneficial in the course of human evolution. I am reminded of one 'just-so' story suggested by Bruce

Bayesian reasoning has positive veritistic effects. His claim is that the use of Bayesian inference is objectively likely to raise the knower's degree of knowledge "in *any* report environment."[29] Whether actual agents typically do employ Bayesian inference patterns in daily reasoning will strike some as a contentious issue. Goldman notes that his intention is not to argue that such reasoning actually is in use or that such reasoning would suffice for justificatory purposes.[30] Taking a line of argument from an earlier Putnam might prove more fruitful. We saw that Hardwig employs a *reductio ad absurdum* to make the case for epistemic dependence. The force of his argument rests upon the epistemic success of science. Science is remarkably successful in advancing knowledge and clearly relies upon non-reductive uses of testimony. Hardwig argues that if one's epistemology would deny knowledge in cases where epistemic dependence obtains, so much the worse for that epistemology. There is an inference to the best explanation here. Suppose that testimony is, in fact, an unreliable process. This hypothesis would seem to make an extraordinary coincidence out of the success of our science: how could our science be so successful if most reports were in fact false? The reliability of testimony is therefore an integral part of an inference to the best explanation for the success of science. Although more could be said regarding the empirical merits of the reliabilist's claim, I will tentatively adopt the foregoing as my basis for the claim that testimony is a reliable

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Hunter. Imagine three groups of early hunter-gatherer humans. Group 1 consists of the skeptics; they are completely incredulous and never believe what their fellows say without first checking for themselves. Group 2 consists of the gullibles; they are utterly credulous and always believe what others report. Group 3 are more like we modern humans; they are generally credulous but inclined to question reports when circumstances suggest incredulity. It is easy to imagine Groups 1 and 2 as, in Quine's words, "having the pathetic but praiseworthy tendency of dying before reproducing their kind." The skeptics would lack the benefits that come from cooperation based upon trust and the gullibles would fall as easy prey to the more sinister of their kind.

[29] Goldman (1999), at p. 115.

process.

2.5 Defining Testimonial Justification

A reliabilist approach to testimonial justification seems promising but there are obstacles that such an account must address. There are numerous critiques of reliabilism extant in contemporary epistemology – the generality problem and various well-known counter-examples to both the necessity and the sufficiency of reliability for justification – that a full defence of reliabilism would have to address. These sorts of criticisms will also arise in the case of reliabilist testimonial justification. In discussing the sufficiency of his reliabilism, Goldman raises an example that is useful for our discussion. The objection, raised by Putnam, goes as follows:

> Suppose, Putnam says, that the Dalai Lama is in fact infallible on matters of faith and morals. Then anyone who believes in the Dalai Lama, and who invariably believes any statement the Dalai Lama makes on a matter of faith or morals, uses a method which is 100 percent reliable. Such a person's beliefs in matters of faith or morals should all be justified, according to reliabilism, even if his argument for the belief that the Dalai Lama is never wrong is simply "the Dalai Lama says so."[31]

We can refocus this example as a case of testimonial justification. The would-be knower's belief that the Dalai Lama is never wrong on matters of faith and morals is a testimonial belief founded upon the testimony of the Dalai Lama. If testimony were in fact a reliable process, the simple reliabilist account would endorse credulity in respect of the Dalai Lama's report that he is never wrong on matters of faith and morals. Surely, the critic would charge, such a testimonial belief cannot be justified and, if so, then the

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[30] *Ibid.*, at pp. 122-123, and 130.

[31] Goldman (1986), at p. 109. This sufficiency objection trades upon internalist intuitions: even if the Dalai Lama turns out to be reliable on matters of faith and morals, it nonetheless seems that this fact is accidental absent some sort of internal access to the underlying premises that support his presumably

reliability of testimony as a process cannot be sufficient for justificatory purposes.

In the original counter-example Goldman invokes clause (b) of his framework for justification, requiring that the permissiveness of the J-rule not be undermined by the knower's cognitive state, to rule out these beliefs founded on the 'Dalai Lama method.' The reason for this is that, "Pending specification of some legitimate (metareliable) psychological process, one is left with the suspicion that no metareliable process has been used, that the believer has simply stumbled upon a method which, by chance, is infallible."[32] When we construe this example as a case of testimonial justification, it draws our attention to the need for a similar 'no undermining' clause in respect of reliabilist testimonial justification.[33]

What form of evidence would serve for a reliabilist defeater clause? Since our concern rests with a non-reductive account of testimonial justification we cannot help ourselves to any justifying premises of the reported belief itself. Coady's work suggests the importance of the "coherence and cohesion" of the reported belief in light of background beliefs possessed by the cognizer. What sort of background beliefs? Paul Faulker usefully suggests that we weigh the reported belief on the basis of the credibility of the testimony judged against the prior probability of the proposition expressed.[34] But what does this credibility consist in and what factors are involved in this assessment? The beginnings of such an analysis are fortunately present within social epistemology. In his

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justified pronouncements.

[32] *Ibid.*, at p. 110. Goldman concedes that if such a specification of the metareliable process involved in acquiring the method (believing the testimony of the Dalai Lama on matters of faith and morals) were made the beliefs would be justified.

[33] Goldman also identifies this need: "Of course, a sophisticated form of reliabilism would also accommodate 'defeating' evidence, so that if the hearer has evidence *against* a testifier's credibility, she is not justified in believing that testifier's report." Goldman (1999), at p. 130.

article "Justification, Sociality, and Autonomy" Schmitt discusses many of the problems associated with reductive testimony that I canvassed in section 2.2 and endorses a non-reductive approach. Under conditions where the knower lacks a reductionist justification for some piece of testimony, Schmitt contends that justification remains possible based upon one's own justified beliefs about source reliability and, supporting this, one's own justified beliefs concerning the topics of the source's report.[35] The knower would assess the reporter's credibility against the background of these 'topical' beliefs concerning source credibility, and if the knower's assessment is favorable, the reported belief would stand as justified notwithstanding the knower's lack of cognitive access to the justifying premises that *p*. The notion that Schmitt conveys here has some affinities with Harman's notion of 'negative coherence' as well as Goldman's account of the considerations applicable to reporter trustworthiness. In Harman's account of reasoning and belief revision he argues that one is 'justified' in accepting a belief where there is an absence of evidence against that belief.[36] Goldman too, gestures toward Schmitt's approach when he argues for the veritistic qualities of testimony. Under the probabilistic approach that Goldman utilizes to make this argument he notes that it is necessary for knowers to be able to estimate testimonial likelihoods. The elements to this estimation that Goldman notes – the reporter's competence, the reporter's opportunity "to detect the putative fact," and the reporter's honesty[37] – are akin to Schmitt's notion in that the knower utilizes

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[34] Faulkner (1998) at p. 307. See also Goldman (1999) at pp. 115-125.

[35] *Ibid.*

[36] Harman (1986), at. p.46; this is Harman's "principle of conservatism." The reader should note that Harman does not purport to be providing a theory of justification (see p.29). The sense of justification that he utilizes seems focused more on the rationality of belief acceptance and revision; issues that Harman suggests are distinct from those engaged by theories of justification.

[37] Goldman (1999), at pp. 123-125.

these topical beliefs to determine the credibility of the reporter. Schmitt does not discuss the particulars of his notion of topical beliefs in any great detail; he simply identifies estimations of source "reliability" (I will speak of this as credibility hereafter)[38] and estimations based, "upon beliefs concerning the topics of the sources' pronouncements." Let's attempt to put some flesh to the particulars involved here.

The first topical consideration reflects estimations of source credibility based upon justified individual beliefs concerning the source. The source-centred estimations that I envision here would include beliefs of the following sort:

(1) Past experience with source credibility. If the knower has a history of receiving true reports from the source it is reasonable to expect present reports to be credible, just as it is reasonable to doubt source reports where the source has a history of reporting falsely.

(2) External conditions affecting source belief production. If the knower possesses justified evidence of external conditions that would affect the source's belief – negatively or positively – this may impact upon the knower's assessment of source credibility. For example, if one's source reports seeing a red coloured book in a room that one knows to have red lighting, we should expect a negative assessment of the source's credibility.

(3) Individually known behavioural patterns associated with the subject may enhance or detract from the knower's assessment of source credibility. For example, some subjects exhibit predictable behaviour when telling falsehoods. If the knower

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[38] Source credibility is more appropriate to the account that I envision than the characterization of reliability that Schmitt utilizes. A source would be reliable if the beliefs reported by the source were, more often than not, true. While reliability in this sense is undoubtedly a factor in the credibility of a reporter (it is the first source-centred estimation that I identify), it is not the exclusive factor. What we are interested in

possesses a justified belief to this effect and discerns such behaviour in the source's present report, then the knower has a negative consideration in his assessment of source credibility.

(4) The presence of contradictions or inconsistencies within the source's report. Too many contradictory or inconsistent statements in a source report suggest error or deception, just as a coherent report enhances our sense of source credibility.

The second consideration involves estimations of source credibility founded upon topical beliefs that are external to the subject source and related to the topic matter of the source's report. The knower assessments that I envision here would include beliefs of the following sort:

(5) Agreeing or contrary reports of the same matter from other sources. Although the reports of other sources would themselves be testimonial reports, numbers of concurring reports mutually support one another and lend probative weight. By contrast, a preponderance of contrary reports tends to decrease source credibility.

(6) Known understandings of related particulars can also assist in judging source credibility if the matter reported is either consistent with, or inconsistent with these understandings. For example, if my friend Jimmy tells me that he was studying in the law library last Sunday evening, and I know from my own experience that the law library is closed on Sundays at this time of year, then I have reason to doubt Jimmy's credibility. His report is inconsistent with an individually known fact.

One further consideration is germane to this discussion of external topical beliefs.

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is whether the source is credible, or belief worthy, with respect to some particular reported belief. This may be the case even if the reporter is generally unreliable. See, for example, Fricker (1987), at p. 73.

Consider the following context of a testimonial report. Over the past year my friend Jimmy has been behaving erratically. While at a party, *X* reports to me that he spoke recently with Jimmy and that Jimmy announced that he has been diagnosed with schizophrenia. Other things being equal, my inclination is to believe the report because it makes sense out of Jimmy's record of erratic behaviour; that is, the report takes a wide range of individual beliefs that I possess (concerning Jimmy's erratic behaviour) and unifies them under a single explanatory hypothesis.[39] To reflect this notion of explanatory coherence we may add the following to our list of external topical considerations:

(7) Reported beliefs that stand in a relation of explanatory coherence to other beliefs possessed by the knower will enhance source credibility. By contrast, reported beliefs that undermine explanatorily significant systems of belief will tend to detract from source credibility.

The account discussed thus far presents a range of considerations that knowers bring to bear in assessing the credibility of testimonial sources. I do not mean this to be an exhaustive list – other considerations perhaps apply as well – but these topical considerations shall suffice to sketch the justificatory account that I have in mind. Two questions arise at this point: how do these considerations function in rendering an assessment of source credibility and how does this assessment contribute to a definition of testimonial justification? The topical considerations described do not function as a sort of checklist. Some considerations might not be present in the context of a given report and often considerations will pull in differing directions – some tending to speak in favor

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[39] For further discussion of explanatory coherence, see Bonjour (1985) at pp. 98-100, and Harman (1986), chapter 7. See also Kitcher, P., "Explanatory Unification" *Philosophy of Science* 48 (1981) 507-531, for an

of source credibility and some tending to suggest otherwise. The process that I envision is much more akin to Rawls' notion of wide reflective equilibrium.[40] In arriving at an assessment of source credibility with respect to some testimony that *p* we seek a reflective equilibrium between considered judgments of these topical sorts, the credibility assessment that would account for them, and wider contextual considerations regarding the nature of the inquiry.[41]

With the foregoing discussion in hand we now have a mechanism for assessing reporter credibility with respect to any reported belief. For the purpose of defining testimonial justification I shall characterize the process of assessing reporter credibility as one of evaluating the "coherence and cohesiveness" of the report in light of the topical beliefs discussed. The following general principle for assessing reporter credibility emerges (I will refer to this as "testimonial justification 1" or TJ-1):

> (TJ-1) A reporter *R* is credible to a knower *S* with respect to some report that *p* if *R*'s report that *p* stands in a relation of coherence and cohesiveness to other topical beliefs possessed by *S*.[42]

The conditional characterization of TJ-1 is preferable for its statement as a general principle since it is more accommodating to various justificatory accounts that one might endorse.[43] The principle nevertheless captures what seems to be the intuitive evidential basis for credibility judgments in cases of non-reductive testimony. This credibility

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excellent discussion of (scientific) explanation in terms of unification.

[40] Rawls (1971), at pp. 47-50.

[41] See Section 2.6 below, for a discussion of the contextual element of this account.

[42] Note that the topical beliefs in question *might* consist in other testimonial reports; for example, *S* might possess a testimonial report from *Q* concerning the general reliability of the reporter *R*. This should be unproblematic provided that *Q*'s report concerning *R*'s general reliability is justified.

[43] A stronger formulation would *de facto* exclude reliabilist justification since the justification of a testimonial belief would depend upon the knower possessing a positive credibility assessment as described by TJ-1. Reliabilist justification would only require the absence of a negative credibility assessment.

assessment, I submit, provides the required mechanism for establishing defeating evidence. We can formulate a reliabilist theory with the standard sort of reliabilist justificatory clause conjoined with an application of TJ-1 as a defeater clause. For example:

> *S*'s believing *R*'s testimonial report *p* at *t* is justified if and only if,
> 1. Testimony is a belief forming process that results in a truth ratio of beliefs that meets a specified high threshold (greater than 0.5), and,
> 2. This permission is not undermined by *S*'s assessment of *R*'s credibility with respect to the report that *p* at *t*.

The foregoing employs the reliabilist intuition that one does not require positive reasons to underwrite the (epistemic) permissiveness of the belief. This permissiveness stands rather upon the fact that the knower exercised a reliable belief generating process and the absence of contrary or undermining evidence. Clause (2) provides the provision for defeating evidence under a reliabilist account of non-reductive testimony. It does so by employing the general principle TJ-1: reliabilist justification will be undermined in this account if and only if the credibility assessment discussed above yields a determination that the reporter is not credible with respect to the reported belief.

2.6 The Context of Testimonial Justification

Anyone with internalist sympathies is apt to baulk at the account of testimonial justification thus far articulated. While the proposed accommodation for defeating evidence is fine for situations where the knower actually possesses defeating evidence it nevertheless places no positive duty upon knowers to reflect upon defeating evidence. An objection might run as follows. In the course of a day Martin reports fact *p* to John and Liz at different times. Martin is a credible reporter under TJ-1 and *p* is true. Liz is a very

careful knower and reflects thoughtfully upon Martin's credibility as suggested under TJ-1. John, on the other hand, is a very slothful cognizer and gives no thought to Martin's credibility whatsoever in deciding to believe *p*. Under the reliabilist account articulated both John and Liz would be justified. Surely, the objector will argue, there is a sense in which Liz is more epistemically responsible or praiseworthy than John. Yet, if one turns our externalist account into an internalist one by placing a positive duty upon knowers to undertake something like the credibility assessment suggested by TJ-1, one generates the following sort of puzzle that is familiar from the earlier discussion of reductive testimonial justification. This would seem to introduce skepticism concerning a wide range of testimonial beliefs. For example, consider the case where I receive directions to a destination in an unfamiliar city upon asking a stranger. I know very little of the stranger or his city yet I will, upon receiving the asked for directions, act upon them as though I now possess the relevant knowledge. To require a positive credibility assessment as embodied in the general principle TJ-1 seems to require much more reflection upon source credibility than I have in this case of the friendly stranger who provides directions in an unfamiliar city.

The foregoing consideration suggests that there is a contextual element to testimonial justification that divides along the different cognitive goals that motivate internalist and externalist justificatory schemes. We should, I submit, set our justificatory expectations in accordance with the knower's cognitive goals.[44] I propose that where a knower possesses a heightened desire or duty to avoid error, the knower will require a

positive exercise of reporter credibility assessment reflection in proportion to the elevated desire or duty to avoid error. Similarly, where the contextual situation is such that one's concern is less with error avoidance than with the acquisition of a great number of true beliefs, it seems reasonable to relax the justificatory requirements for source credibility and rely upon the reliability of testimony complemented by our provision for defeating evidence.[45] Adding this notion of contextuality to the definition of individual non-reductive testimonial justification yields the following principle (I will call this "testimonial justification 2" or TJ-2):

> (TJ-2) A reporter *R* is credible to a knower *S* with respect to some report that *p*, if,
> 1. *R*'s report that *p* stands in a relation of coherence and cohesiveness to other topical beliefs possessed by *S*, and,
> 2. The extent of positive topical evidence required by *S* to render a credibility assessment of *R* will vary proportionately with the degree that *S* needs or desires to avoid error.

The addition of clause (2) permits us to address cases such as my example of the friendly

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[44] This is the reason why I characterized the process of credibility assessment as one of *wide* reflective equilibrium: it is a process that must take into consideration wider contextual considerations that reflect our cognitive goals in the given inquiry.

[45] In "What Is Testimony?" Peter Graham asks why Coady raises the epistemic standard in his analysis of testimony. Graham suggests that it is because Coady relies for his analysis upon testimony in formal settings such as the courtroom. This point underscores what I am suggesting here. In some contexts our cognitive goals demand differing justificational thresholds. See, Graham (1987), at p. 231. The introduction of this contextual element motivates a piece of epistemological heresy. I have already noted that internalist and externalist theories of justification answer to differing intuitions: error avoidance one the one hand and optimization of true beliefs on the other. Many of the objections that arise in respect of internalist and externalist theories often find their purchase by appealing to intuitions that stand on the other end of this continuum. Perhaps the lesson that should be taken from this is that both intuitions are correct insofar as they answer to different epistemological needs and goals. Instead of viewing rival justificatory theories as competitors, perhaps we should begin to view them as appropriate or inappropriate given the context of the inquiry. This notion is heresy because of what Fricker calls the "Unity Constraint," the notion that, "Unless we can see all kinds of knowledge thus as instancing a single conception, we fail to exhibit it as a single thing achievable in different ways, as we surely must do." See Fricker (1987) at p.62. This piece of heresy is not something that I need to endorse for this project – I would argue that the principles formulated here are applicable to a justificatory theory of non-reductive testimony regardless of one's preferred justificatory approach – although the foregoing analysis of testimonial justification does tempt one toward this heresy. I owe thanks here to Bruce Hunter, both for stimulating my reflection about the intuitions that inform the externalism/internalism debate, and for prompting this aside.

stranger. Assuming that my desire to avoid error in this case is markedly less than my concern to acquire the relevant belief, my assessment of source credibility might consist, for example, in the knowledge that the source expressed a willingness to help, the clarity of the directions, and the absence of any contradictions or inconsistencies in the directions reported; i.e. the mere absence of defeating evidence.[46] This is a revision to the general principle that, I submit, closely patterns commonplace occurrences of testimonial justification where one's reflection upon source credibility is largely, albeit not totally, barren. With this revision many banal reports will be a basis for justified belief – an outcome that accords with our pre-theoretic intuition.

While there are undoubtedly unforeseen difficulties lurking in the individual non-reductive account of testimonial justification presented here the principle TJ-2 does, I submit, provide a defensible account that accords with our intuitions concerning testimonial justification. The application of the principle to a viable justificatory theory allows for the justification of a wide range of testimonial beliefs, patterning the sorts of conditions under which we would claim testimonial knowledge, and satisfying the non-skepticism requirement that so plagues reductive accounts. Now that a defensible account of testimonial justification is in place, Chapter 3 shall move on to consider the application of this account to testimonial evidence presented in the courtroom environment and the prospects for an inclusionary response to the concerns articulated in Chapter 1.

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[46] Goldman provides an example of this sort in his discussion of estimating testimonial likelihoods. The considerations that he suggests in this case are akin to the topical considerations that I've discussed here. See Goldman (1999), at p. 125.

Chapter 3 – The Inclusionary Approach

In this chapter I shall be considering the 'inclusionary approach' to expert scientific opinion evidence. Recall that under this approach the threshold for the admissibility of this form of evidence is the mere [legal] relevance of the putative testimony. Questions as to the reliability of the testimony, or its probative weight, are put over to the trier of fact's determination and it is the task of the adversarial process – the presentation of evidence, cross-examination, and judicial warnings – to provide the trier of fact with the means of forming a justified belief as to the merits of the opinion. Evidence of this sort is testimonial. In this chapter my task is threefold: (a) to apply the principles of testimonial justification articulated in Chapter 2 to the legal context; (b) to analyze the rationale of the inclusionary approach and the goals that this response must satisfy; and (c) to critically examine the merits of a purely inclusionary approach to scientific testimony.

3.1 Testimonial Justification and the Law of Evidence

In everyday contexts testimony is one of many sources of knowledge acquisition but in the context of a trial it is the principal source of knowledge. In Chapter 1, we saw that the legal system is a process of dispute resolution whereby a trier of fact determines the facts of the dispute and utilizes these to decide if the appropriate burden of proof has been met on the ultimate issue of the dispute.[1] The law, as given by the trier of law, is

[1] In an accusatorial system such as ours, the "burden of proof" refers to the duty or onus of affirmatively proving facts in issue. The party that asserts the existence of such facts must "establish by evidence a requisite degree of belief concerning a fact in the mind of the trier of fact or the court." See *Black's Law Dictionary* 6th Ed. (St. Paul, West Publications, 1990). In criminal matters the requisite degree of belief is

then applied to resolve the matter. The trier of fact is therefore called upon in the process to come to possess knowledge - justified true belief - regarding various facts in issue. The basis for trier of fact knowledge is almost wholly derived from the testimony of witnesses produced at trial by the parties to the dispute.[2] Various forms of real evidence - photographs and other tangible objects produced for the trier of fact's inspection - may also be introduced as exhibits but, with some exceptions, it is necessary to "lay a foundation" for such evidence "through the direct testimony of a witness."[3] Testimony consequently stands at the heart of the 'legal search for truth.' In this section I shall examine the process of evidence presentation at trial and argue that this process closely patterns the account of testimonial knowledge presented in Section 2.4.

I argued in Chapter 2, Section 6, for a contextual understanding of testimonial justification. Under the contextualized principle of testimonial justification (what I characterized as definition TJ-2) the extent of the topical knowledge required by a knower to assess a reporter's credibility will vary depending upon the degree to which the knower desires to avoid error. With a greater desire or duty to avoid error the knower will require greater topical knowledge supporting the reporter's credibility. We must therefore come to some understanding of where testimony given in the legal context falls within this

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proof beyond a reasonable doubt; in civil matters it is proof on the balance of probabilities. The "ultimate issue" in a trial refers to the question that must finally be answered. For example, in a criminal matter, whether the accused committed the unlawful act and whether the accused did so with the requisite mental intent.

[2] "Direct evidence" is evidence which, if believed, proves the existence of a fact in issue without inference or presumption; see *Black's Law Dictionary*, 6th Ed.. "Circumstantial evidence" by contrast refers to "facts such that their existence is a premise from which the existence of the principal fact may be concluded by necessary laws of reasoning." *R.* v. *John* (1970), 2 C.C.C. (2d) 157 (S.C.C.), at p.175. See also, Kaye (1992), at p. 315.

[3] Lubet (2000), at p. 44. Real evidence may include "surrogate real evidence" in the form of photographs, audio or visual recording; demonstrative evidence in the form of court-room demonstrations, or illustrative evidence that is utilized to explain or clarify other evidence. This evidence may be direct or circumstantial.

contextual framework. In arguing against Coady's definition of testimony, Peter Graham renders an interesting observation regarding legal testimony and epistemic duty:

> Courts have an interest in raising the standards and taking steps to enforce them to ensure that juries are epistemically justified in accepting what witnesses state, but that does not show that testimony *per se* need satisfy those higher standards.[4]

This heightening of standards demands that the law embody an epistemology of testimony that errs on the side of error avoidance. For this reason the justification of testimonial beliefs in the legal context is internalist in nature. The context of legal inquiry requires that the knower, the trier of fact in this instance, possess positive reasons for making factual determinations. Topical considerations such as those discussed in Chapter 2, Section 5, must positively support the credibility of the reporter that the trier of fact relies upon. What, however, is the basis for this, broadly internalist, "heightened interest" in the justificatory requirements for legal fact-finders? A trial involves a state provided forum for conflict resolution through the application of law. There are clear adverse consequences to individuals that arise from this process: state applied punishment in the case of criminal matters, and state enforced sanction or judgment in the civil context. In our political morality the application of such force by the state against individuals is justifiable only if it is in accordance with fairness and due process. In epistemic terms due process requires that the facts supporting some state sanctioned action must be proven true in court (i.e. they must meet a specified burden of proof) so as to ensure, so far as is possible, that such state sanction is visited only upon those that deserve it.

We have seen that testimony is the principal source of knowledge for triers of fact and I have argued that the trial process must provide triers of fact with positive

(internalist) justification for such knowledge founded on testimony. How does the trial process accomplish the task of enabling triers of fact to possess testimonial justification? To understand this we must examine the presentation of evidence by the parties to a dispute in greater detail. In the adversarial tradition this proceeds through the calling of witnesses to testify under the examination of the parties. The testimony of a witness generally consists of reports from the witness as to what the witness actually saw, heard, or otherwise knows that, either directly or by inference, tends to establish some fact at issue in the dispute. The examination proceeds *via* direct examination and possibly cross-examination and re-examination. Direct examination (or examination in chief) is the first examination of a witness by the party producing the witness. From an epistemic standpoint direct examination serves the following goals:

1. The introduction of undisputed facts;
2. To enhance the likelihood of disputed facts; and,
3. To provide the foundation for real [and demonstrative] evidence.[5]

A trier of fact generally may not consider some proposition unless that proposition has been introduced into evidence at trial.[6] Of course, many facts will have a bearing on the dispute that are not properly the subject of testimony because they can already be

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[4] Graham (1997), at p. 232. Graham's complaint in this article is with Coady's definition of testimony. The particulars of this dispute are moot for my purposes here.

[5] See Lubet (1997) at pp. 45-46 for a fuller account of the goals served by direct examination.

[6] The circumscribed factual environment of the courtroom leads to many familiar parodies of legal inquiry. In Austin Freeman's *The Eye of Osiris*, for example, the author plays on the supposed contrast between the independent and unfettered judgment of the scientist and the circumscribed factual environment of the courtroom:

> "In science, no doubt. Not in law. A court of law must decide according to the evidence which is before it; and that evidence is of the nature of sworn testimony. If a witness is prepared to swear that black is white and no evidence to the contrary is offered, the evidence before the Court is that black is white, and the Court must decide accordingly. The judge and jury may think otherwise - they may even have private knowledge to the contrary - but they have to decide according to the evidence." Freeman, A., *The Eye of Osiris* (New York, Charles Scribner's Sons, 1928), at p. 124.

regarded as known by the Court. Such facts are a matter of judicial notice.[7] Many facts that are undisputed by the parties cannot be taken as known by the Court. Direct examination must therefore (generally) seek to establish these undisputed facts.[8] Critical facts in a trial are, of course, often the subject of dispute between the parties - with one party claiming that such a fact obtains or obtained and the other denying this or attempting to cast doubt on the claim. Direct examination of witnesses can provide a party with the opportunity to elicit testimony that will support the party's account of such disputed facts. Finally, direct examination is often required, as noted earlier, to provide a foundation for the introduction of real and demonstrative evidence at trial.[9]

A party may also conduct a redirect examination of a witness after cross-examination. The scope of the re-direct (or re-examination) is limited. In most jurisdictions the party conducting redirect may not introduce new matters on redirect, although in some U.S. jurisdictions judges do have the discretion to re-open direct examination and allow questions on such matters.[10] In Canada, re-examination is narrowly restricted to matters arising from the witness' testimony on cross-examination.[11] Regardless of the scope permitted, the purpose of redirect examination remains the same. This form of examination allows a party to attempt to "rehabilitate" the testimony of the

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This is, of course, fiction, as the trier of fact may believe a witness or not regardless of whether contrary evidence is presented.

[7] The doctrine of judicial notice holds that, "[G]enerally speaking, a court may properly take judicial notice of any fact or matter which is so generally known or accepted that it cannot reasonably be questioned, or any fact or matter which can readily be determined or verified by resort to sources whose acceptance cannot reasonably be questioned." *R.* v. *Potts* (1982), 66 C.C.C. (2d) 219 (Ont. C.A.) at pp. 225-226.

[8] Other evidence, documentary evidence for example, may also establish disputed facts.

[9] The purpose of testimony utilized to establish a foundation for real or demonstrative evidence is essentially to support, through testimony, the claim that the object or exhibit is what it purports to be. See Mauet, Casswell and Macdonald (1995), at p. 102, 154, and section 5.3.

[10] Lubet (1997), at pp. 209-210.

witness by further explaining matters arising from cross-examination, addressing "seeming inconsistencies," correcting "errors or misstatements," or rebutting adverse inferences drawn from the cross-examination.[12]

In both direct examination and re-direct examination the trier of fact receives testimonial evidence from witnesses that may contribute to the final factual determination rendered by the trier of fact. In both instances the questioning process provides an opportunity for the emergence of what was described earlier as topical considerations. These considerations can contribute to the credibility assessment that, with the requirement of positive reasons for belief that the legal context demands, are necessary for the formation of a justified trier of fact belief. The salient topical considerations that may emerge through examination of this sort are:

(1) External conditions affecting source belief production.

The witness himself may describe external conditions that impact upon the trier of fact's credibility assessment. For example, the witness may relate identification made under poor lighting conditions. External conditions affecting source belief production might also emerge through other testimony given at trial (see point 5 below).

(2) Behavioral Patterns.

Behavioral patterns associated with veracity will often play a role in trier of fact credibility assessments of witnesses. Hesitancy, evasiveness, nervousness, and loss of eye

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[11] See, for example, *R.* v. *Kay*, [1950] O.R. 235 (C.A.) and Sopinka (1981) at pp. 82-85.
[12] Lubet (1997), at p. 209.

contact - while admittedly extremely context sensitive[13] - are generally reliable indicators of testimonial uncertainty or deception.

(3) Contradictions and Inconsistencies.

Contradictions or inconsistencies may be *prima facie* apparent within witness testimony on direct examination. Such considerations always detract from testimonial credibility.

(4) Background Knowledge.

Triers of fact possess background knowledge and they will assess witness credibility in light of this background knowledge. Most of us, for example, have some acquaintance with the physical effects of alcohol consumption. We will, other things being equal, bring this background knowledge to bear when assessing the credibility of a witness who claims, in an impaired driving case, not to have been impaired after consuming a specified amount of alcohol.

(5) Testimonial Comparison.

If there are multiple witnesses at trial the consistency between witness reports may mutually enhance their testimonial credibility. Similarly, inconsistencies or contradictions among witnesses, especially those called by the same party to a proceeding, may detract from witness credibility.

(6) Explanatory Coherence.

Explanatory coherence can be a key factor in the determination of a positive credibility assessment or, with its absence, a negative assessment. Legal disputes often present

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[13] Behavioural patterns associated with credibility are notoriously context sensitive. For example, while maintaining eye contact with an examiner is considered an indicator of truthfulness in the Anglo-Saxon tradition, this behaviour is thought to be disrespectful in an aboriginal context. See, for example, Ross (1992).

factual puzzles to the trier of fact: what happened, why did it happen, and, where liability (criminal or civil) is at issue, who is responsible? There will be events presented in the course of testimony that triers of fact will want explained. The coherence of witness testimony, how plausibly and thoroughly it accounts for the events related, is a strong *indicium* of witness credibility. We also similarly expect that where a witness is doubtful as to the facts related, or deceptive, there is a greater chance that such a witness will be unable to render such a coherent account.

In direct examination the questioning of a witness is largely under the control of his or her counsel. Counsel will be careful to ensure that the questions asked on direct, and the answers they are meant to elicit, are favorable to the party calling the witness. "Friendly" witnesses called by a party are also often briefed by counsel for the task of giving testimony. It should come as no surprise that direct examination should usually enhance a party's case. Direct examination is not, however, the only foundation that triers of fact possess for making credibility assessments. Our legal system is an adversarial system and it permits the cross-examination, or questioning, of a party's witnesses by opposing counsel. In our system of law this ability to confront the witnesses of the opposing party is fundamental; with respect to criminal matters this falls within the right of an individual to make "full answer and defence." The scope of cross-examination will vary across jurisdictions. Most U.S. jurisdictions limit the scope of questions to matters arising from the direct examination of the witness. In Canada cross-examination is not restricted to matters raised on direct and may concern any relevant issue.[14] In those

[14] Lubet (2000), at pp. 80. In addition to relevancy, the scope of cross-examination in Canada is also restricted by, "a general prohibition against questions to which the answers would be inadmissible on

jurisdictions where cross-examination is limited to matters arising on direct, exceptions are usually made for questions concerning the witness' credibility as well as for instances where the witness has, during the cross-examination, raised an issue extending beyond his direct testimony.[15] The purpose of cross-examination is varied but from an epistemic standpoint cross-examination serves to challenge or undermine witness testimony and, if possible, procure helpful admissions. The testimony that the cross-examiner will seek to elicit from the witness is often precisely akin to the topical considerations, discussed in Chapter 2, Section 5, that *negatively* impact upon witness testimonial credibility.

3.2 The Rationale of the Inclusionary Approach

In recent years Canadian and U.S. jurisdictions have increasingly tended toward an inclusionary approach toward the admissibility of evidence in the courtroom. The approach, with its reliance upon the adversary system, complements the training and inclinations of our legal profession. For this reason many legal professionals and scholars may be understandably inclined to favour this approach as a response to scientific testimony. In Chapter 1, I noted that this approach reflects a venerable epistemic principle – the requirement of total evidence. In the form presented in Chapter 1 this would require that a cognizer should gather and consider all of the evidence (reasonably attainable) relating to the matter under inquiry. In legal terms this principle echoes in our rules of legal relevance. Where the evidence consists of scientific testimony, however, I noted three sorts of problems that draw our attention: fact-finders relying upon unreliable

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examination-in-chief, and the discretion of the trial judge to limit cross-examination where the probative value of the evidence is outweighed by its prejudicial effect." *Ibid.*

science, fact-finders failing to accord proper weight to reliable science, and fact-finders unable to render sound reliability assessments in cases where competing scientific evidence is proffered. If legal relevance is our only threshold for the admissibility of scientific testimony we shall have to obtain some sense of how the proponent of a pure inclusionary approach would propose to remedy these potential difficulties.

Our legal system (in Canada and the U.S.) is an adversary system and it is to this piece of legal technology that the proponent of the inclusionary approach will turn in offering a response to the concerns regarding scientific testimony. Four features paradigmatically characterize the adversary system:

1. An impartial judiciary that plays a passive role in the resolution of legal disputes.[16]

2. Lawyers play the principal role in the presentation of cases for resolution at trial.

3. The adversarial system is accusatorial; i.e. the system is based upon the maxim, '*Ei incumbit probatio, qui dicit, non qui negat.*'[17]

4. Fact-finding resides in the jury system.[18]

The second of these features is critical for the advocate of the inclusionary approach. The proponent of this approach will argue that it is the presentation of evidence by lawyers within the adversarial setting, with both parties to the dispute zealously represented by

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[15] Lubet (1997), at p. 87.

[16] In our system the judge is the trier of law, ruling on all questions of law arising from the matter. The judge generally plays no role in the investigation of the matter or the direction of the inquiry at trial.

[17] That is, 'He who asserts must prove, not he who denies.'

[18] It should be noted that fact finding in our system is not the exclusive province of the jury system. Many matters will be tried by judge alone and in these disputes that judge is both trier of law and trier of fact. Jurisdictions will set out rules that govern the circumstances under which jury trials may (or must) occur; these vary substantially across differing jurisdictions. When interpreting the rules of evidence - the prejudicial effect versus probative value exclusionary rule for example - one always does so from the standpoint of a jury trier of fact, regardless of whether the trier of fact is actually a judge.

counsel that serves to diminish the potential for fact-finder error of the sorts discussed in Chapter 1, Section 3. Each side will present its evidence in the most favorable terms and each will rigorously seek to challenge the evidence of the opposing side. Through this questioning, and possibly the presentation of contrary witnesses, the proponent of the inclusionary approach will argue that triers of fact receive the requisite facts and background knowledge necessary to render a proper determination regarding the weight of the scientific opinion. Indeed, some commentators argue that the lay juror is actually in a superior position to evaluate scientific testimony over lay testimony:

> In contrast to a lay witness, whose credibility largely determines the truth-value of his or her testimony, a scientific witness often can share with the fact-finder the entire process from raw evidence to conclusion (opinion), and the fact-finder, with help from counsel, is in a position to detect errors or be persuaded. This is not to say that scientific and technical evidence has no subjective or interpretive components; rather it argues that such components are narrower and more amenable to scrutiny than is the situation with lay witnesses.[19]

In a sense the claim is that the presentation and challenge of the scientific testimony at trial by counsel serves as a kind of "crash course" for the fact-finder in the underlying science. Armed with what he has distilled from the questioning of the scientific expert, the jury may retire to make an informed judgment as to the weight of the opinion.

The success conditions for the inclusionary approach to scientific testimony should be obvious. In order for the adversary system to fulfil its epistemic ends it must be the case that adversarial questioning does, by and large, provide the requisite basis for laypersons to form justified true beliefs concerning scientific testimony. In the next section I will consider whether the general account of testimonial justification in the legal context, discussed in Section 3.1, can reasonably be extended to the testimony of experts.

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[19] Saks and Van Duizend (1983), at p. 5.

3.3 The Adversarial System and Science: A Principled Objection

Turning to evaluate the inclusionary approach as a response to the potential difficulties posed by scientific testimony, I find the prospects for this response - with unfettered application - to be less than promising. In order for this approach to serve as an adequate response we must be confident that adversarial questioning does yield justified true beliefs regarding scientific testimony among lay jurors in a sufficiently high proportion of cases. The rationale underlying this approach holds that this is possible because the adversarial presentation of the expert's testimony at trial will provide the juror with the means to discharge his evaluation of the evidence. While I have confidence that the adversarial system performs reasonably well with lay testimony there are nonetheless important differences between lay testimony and expert testimony that render the trier of fact's task implausible with respect to scientific testimony within the heightened justificatory environment of the courtroom. I will focus upon two difficulties with the rationale underlying the inclusionary approach. The first of these proceeds directly from the application of our testimonial principles to the courtroom context and the second arises from the interplay of scientific inquiry and legal (adversarial) inquiry. I will proceed with the former objection in the present section and consider the latter in Sections 3.4 and 3.5 below.

Reconsider the arguments of Hardwig and Schmitt concerning scientific testimony canvassed in Chapter 2. In the courtroom an advocate presents to the trier of fact the testimony of the expert and the opposing advocate seeks to challenge this evidence. The proponent of the inclusionary approach wants to assert that this provides

the trier of fact with the basis for forming a justified true belief regarding the merit of the scientific opinion. In Chapter 2, I argued that the difficulty of escaping epistemic dependence upon expertise was a consideration in favor of a reliabilist theory of testimonial justification. In Section 3.1, however, we saw that the law demands a heightened internalist standard for trier of fact knowledge; we require that legal fact-finders possess positive reasons for their factual determinations. The problem of epistemic dependence upon expert authority under such an internalist justificatory requirement consequently reasserts itself.

Does the adversarial presentation of expert testimony suffice to meet an internalist justificatory standard? Given talent, time and study it is conceivable that some could escape epistemic dependence upon some experts some of the time.[20] This assumes, though, that the knower is in a position to undertake his own investigation of the science at issue - with all that this entails. The acquisition of scientific knowledge in the internalist sense, we must remember, comes through a long process of education and immersion within a scientific community. On an internalist standard, one requiring that the knower possess the justifying premises that *p*, such expert knowledge is not to be had wholesale on the word of others. In the courtroom, unlike the process of a true scientific education, the knower only has at his disposal the testimony of the expert, the cross-examination of the expert by opposing counsel, and possibly the testimony of opposing experts or court appointed experts. The trier of fact lacks the opportunity for independent investigation and has only limited time to digest the justification that the expert provides for the opinion. Suppose, for example, that a party *A* to a trial calls expert *B* to testify to

some alleged scientifically based opinion *p*. *A*'s counsel will seek to establish the basis for *B*'s opinion in the examination-in-chief: that evidence (e.g. experimental test results) *m, n,* and *o* supports that *p*; that methods *x, y,* and *z* were adhered to, and that these methods are both reliable and appropriate. Is the trier of fact in any better epistemic position to evaluate the opinion that *p* in a manner that escapes his dependence upon the expert? The answer must be negative.

> Usually, a novice (1) lacks all or some of the premises from which an expert reasons to her conclusion, (2) is in an inferior position to assess the support relation between the expert's premises and conclusions, and (3) is ignorant of many or most of the defeaters (and "defeater-defeaters") that might bear on an expert's arguments.[21]

In the assessment of lay beliefs founded upon testimony, the trier of fact may rely upon a store of experience and background knowledge to assess credibility. With expert testimony the lay trier of fact lacks the requisite background to independently judge the evidence, *m, n,* and *o,* and the methods, *x, y,* and *z*, given as support for the expert's opinion that *p*.

If the lay trier of fact cannot be expected to evaluate the expert's opinion for himself, perhaps he may draw some succor from the expert's testimony concerning a scientific consensus or wide agreement regarding the scientific evidence at issue. While advocates will seek to make the most of any consensus accruing behind their experts' science,[22] we readily encounter difficulties from the epistemic standpoint of legal inquiry.

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[20] Hardwig (1985), at p. 340. See also, Goldman (2001).

[21] Goldman (2001), at p. 96.

[22] If we leave the present difficulty aside, it is important to note that there are good reasons for advocates to emphasize any scientific consensus that exists concerning the basis for the testimony. While laypersons may not be capable of evaluating the epistemic significance of a consensus, or the lack of it, these facts may nevertheless provide a legitimate basis for conditioning on the evidence if the evidence first meets some threshold of reliability as envisioned in some of the exclusionary and non-adversarial approaches that I will examine in Chapters 4 and 5.

To begin with, there is the regress articulated by Schmitt and discussed in Chapter 2.[23] The lay trier of fact is in no better position to evaluate for himself whether the consensus or agreement is well-founded. This would presume access to precisely the sort of background knowledge and experience that the knower lacks and which prompts the need for the expert opinion in the first place.[24] It does not seem as though we are going to escape epistemic dependence along this tack, so let's try working this notion of the "numbers" argument another way.

A Bayesian approach to evidence enjoins one to update one's beliefs in a hypothesis by conditioning on new evidence regarding the hypothesis. On simplistic Bayesian grounds the mere fact of numbers, testimony regarding concurring support for the hypothesis, should - *prima facie* - always give the knower grounds for an upward revision in his degree of belief in the hypothesis.[25] Note too that, given that the additional evidence is independent, this upward revision is regardless of the cognizer's own capability of assessing the hypothesis for himself. Could we not say then that Bayesian reasoning provides the novice with a means of assessing scientific opinions - at least in instances where the testifying expert can appeal to a *corpus* of concurring or adverse expert opinion?

While Bayesian updating provides some strength to the notion that non-experts can evaluate expert testimony through evidence of a consensus, the approach nevertheless admits of a problem. One's degree of belief should be enhanced provided that the additional evidence is in fact evidence of the hypothesis at issue. Goldman notes two

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[23] See my p. 50-51.
[24] Schmitt (1987), at p. 51.

instances that illustrate cases where one would not accord additional weight to an opinion on the basis of additional reports: rumors and the case of followers who slavishly or uncritically adhere to the claims of a leader or elite.[26] In these cases the mere repetition of the opinion adds no weight to the credibility of the hypothesis or opinion because the additional opinions are not the result of independent or critical reflection. A rumor does not become more reliable solely on the basis of being uncritically adopted and spread. The additional testimony that *p* merely constitutes "non-discriminating reflectors of someone whose opinion has already been taken into account," and, as such, "add no further weight to the novice's evidence."[27] In order for the concurring opinion to accrue

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[25] Goldman (2001), at p. 100.

[26] Goldman (2001), at pp. 98-99.

[27] *Ibid.*, at p. 102. Consider two concurring experts, X and Y, and a hypothesis, H, upon which they concur. The magnitude of two likelihood quotients is at issue here.

(1) The likelihood of the evidence given X's belief that H:

$$\frac{P(X(H)/H)}{P(X(H)/\sim H)}$$ and,

(2) The likelihood of the evidence given that both X and Y believe that H:

$$\frac{P(X(H)\&Y(H)/H)}{P(X(H)\&Y(H)/\sim H)}$$

The likelihood ratio in (2) will always be greater than in (1) provided that X and Y are independently credible. This situation changes, however, if X and Y are not independent (as in the case where Y is a "blind follower" of X). To see why, note that under the probability calculus, (2) is equivalent to (3):

(3) $$\frac{P(X(H)/H)P(Y(H)/X(H)\&H)}{P(X(H)/\sim H)P(Y(H)/X(H)\&\sim H)}$$

If Y is a blind follower of X, H will be believed by Y regardless of whether or not H is true, yielding:

(4) $P(Y(H)/X(H)\&H)=1$

and,

(5) $P(Y(H)/X(H)\&\sim H)=1$

When the values from (4) and (5) are introduced into (3), (3) reduces to (1); which is to say that (2) is equivalent to (1) in the blind follower case. The agent, in this scenario, is not warranted in revising his belief in H upward in light of the additional 'evidence' provided by the blind follower Y for this does not truly provide additional evidence. This argument is reproduced from Goldman (2001) at pp. 100-101.

weight for the hypothesis the added opinion that *p* must be, "at least partly conditionally independent" of the testimony of the original reporter.[28] In other words, the lay knower must have some reason to believe that the concurring opinion is the consequence, in part, of independent critical investigation.[29] While it is conceivable that a diligent lay inquirer could, with the effusion of much time and effort, investigate a scientific issue in a manner that could disclose such reasons, this is rarely the case in the courtroom context. In the courtroom the lay trier of fact is at the mercy of the time constraints of the trial and the witness lists of the parties to the proceeding.

3.4 The Adversarial System and Science: A Clash of Professional Norms

Thus far I have been considering principled objections to an inclusionary approach that arise from the epistemology of testimony articulated in Chapter 2, and extended to legal inquiry in Section 3.1. I have assumed for the purpose of articulating the preceding objection that there are no process difficulties arising from the adversarial nature of the inquiry. This is, however, a significant assumption to grant. There are noteworthy differences between legal inquiry and scientific inquiry and my second objection to a purely inclusionary approach to scientific testimony arises from the intersection of these forms of inquiry. There are two related dynamics that I wish to explore at this intersection. First, there is the clash between professional norms in law and professional norms in science. Secondly, there are differences arising from the character of legal inquiry and scientific inquiry (I will examine this line of objection in Section

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[28] *Ibid.*, at p. 101.
[29] Goldman (2001), at p. 102. See also Fienberg and Schervish (1986), at p. 787.

3.5). These dynamics, I argue, raise real doubt as to the ability of adversarial inquiry to alone meet the epistemic needs of the law.

Within the adversarial model of legal inquiry lawyers are partisan advocates. Their task is to zealously represent the interests of their clients to the utmost limits permitted by the canons of legal professional ethics. Lord Brougham famously captures the notion of zealous representation:

> An advocate, in the discharge of his duty, knows but one person in all the world, and that person is his client. To save the client by all means and expedients, and at all hazards and costs to other persons, and amongst them, to himself, is his first and only duty; and in performing this duty he must not regard the alarm, the torments, the destruction he may bring upon others. Separating the duty of a patriot from that of an advocate, he must go on reckless of consequence, though it should be his unhappy fate to involve his country in confusion.[30]

The characteristics of a partisan representation of clients where "anything goes" provided that it is within the boundaries proscribed by law, and where victory for his client is the lawyer's principal aim, leads many to liken legal advocacy to a sport.[31] The aim of legal inquiry from the lawyer's standpoint is likewise often characterized in terms of rendering a "story" of the past events that aims at "persuading" the trier of fact.[32] The lawyer's aim at trial is ultimately to secure a factual determination that best accords with his client's interest. To be sure, the duty of zealous representation is not an absolute one. Lawyers are also officers of the court and defenders of the rule of law; the duty of zealous representation is therefore qualified, especially in the prosecutorial context, by the

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[30] Lord Brougham, *2 Trial of Queen Caroline* (London, 1821), at p. 8. Within codes of professional legal ethics the duty of zealous representation is omnipresent. The Statement of Principle, for example, within the *Alberta Code of Professional Conduct,* Chapter 10, reads: "When acting as advocate, a lawyer has a duty to advance the client's cause resolutely and to the best of the lawyer's ability, subject to limitations imposed by law or professional ethics."

[31] MacKenzie, G., (1996), at p. 101.

[32] Kestler (1992), at p.4.

lawyer's duty to the fairness, integrity and propriety of the judicial system.[33] These qualifications upon zealous advocacy do not extend, however, to a duty to seek the truth. While the canons of legal ethics typically provide that the lawyer may not knowingly mislead the court, e.g. by offering perjurious testimony, the lawyer is nevertheless under no positive duty to ensure that the result of legal inquiry is truthful and the rules of legal ethics provide the lawyer with considerable lee-way for omission or obfuscation.[34] Truth, we may say, is a systemic objective of legal inquiry; it is supposed to be the outcome of a fair adversarial inquiry conducted by openly partisan opponents.[35] The courtroom role of the lawyer is therefore combative and partisan with respect to the truth.

While the scientific community generally lacks the sort of written code of professional ethics that one finds within the law, one may nevertheless identify unwritten

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[33] See, for example, the *Alberta Code of Professional Conduct,* Chapter 10, G.2. This is particularly so of Crown lawyers - especially within the context of criminal law. The *Code* places special requirements upon prosecutors that reflects the Crown's role as an advocate of public justice. For example, the prosecutor's primary duty is not to convict but to see that justice is done through a fair trial on the merits; Chapter 10, rule 28(a).

[34] Codes of legal ethics typically restrict lawyers from knowingly perpetrating a fraud upon the court. Rules 13, 14, 15, 17(a), 20(b), and 24 of the *Alberta Code of Professional Conduct,* Chapter 10, are particularly relevant:
Rule 13. A lawyer must not misrepresent to the court the identity of the lawyer's client or witness, the client's position in the litigation nor the issues to be determined in the litigation.
Rule 14. A lawyer must not mislead the court nor assist a client or witness to do so.
Rule 15. Upon becoming aware that the court is under a misapprehension as a result of submissions made by the lawyer or evidence given by the lawyer's client or witness, a lawyer must (subject to confidentiality) immediately correct the misapprehension.
Rule 17(a). A lawyer's representations to the court concerning the facts of a case must be limited to representations supported by the evidence.
Rule 20(b). A lawyer must not counsel or participate in the falsification of evidence.
Rule 24. A lawyer must not counsel a witness to give evidence that is untruthful or misleading.
While these rules prohibit the lawyer from many overt deceptions - for example, examining one's witness on matters that the lawyer knows the witness means to lie about - they do not place a duty upon the lawyer to ensure that the truth emerges from the inquiry. A criminal defence lawyer who knows his client is guilty, for example, can vigorously attempt to cast doubt on the Crown's case (e.g. through questioning on cross-examination that is calculated to undermine the testimony of crown witnesses, or through the presentation of evidence, subject to the rules, tends to undermine the Crown's case).

norms that are characteristic of modern professional scientific practice.[36] Traditional analyses of scientific norms, such as Merton's, cash these norms out in terms of communalism, universalism, disinterestedness, and organized skepticism.[37] Communalism reflects the notion that science is practiced as a community enterprise with research conducted openly and shared by all members of the community. The norm of universalism expresses the notion that scientific discoveries should be reproducible by the community. Thirdly, the scientific community is supposed to be disinterested in the sense that individuals within the community are to practice without bias or regard for pecuniary reward. The fourth category of norm, organized skepticism, reflects the notion that the community will not accept scientific theories or discoveries until they have survived the critical review of the community. It should be observed that these would-be norms come under significant challenge from the sociology of scientific knowledge as part and parcel of the myth of scientific objectivity.[38] The justification of the peer review process of academic science, with the open, lengthy, and rigorous challenge of new research resides, however, in its ostensible conduciveness to truth seeking. Thus, while the norms of

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[35] The claim that adversarial inquiry systemically achieves truthful outcomes is one of the chief consequentialist justifications of the adversarial system. See, Fuller and Randall (1986) at pp. 193-195, and Luban, (1988), at pp. 68-74, for good discussions and critiques of this justification.

[36] There certainly isn't anything like a professional code of ethics that applies to *all* sciences. Of course, some scientific communities whose members are routinely called upon to provide expert opinion do possess professional codes of ethics. The medical and psychological professions are obvious examples. These codified professional norms may occasionally come to play in the testimony of the expert. In *R.* v. *Olscamp*, for example, the court notes the existence of standards of psychological practice and a professional duty on the part of the psychological expert to be aware of the limitations of his opinions and take steps to ensure that the trier of fact is aware of these limitations. *R* v. *Olscamp* (1994), 95 C.C.C. (3rd) 466 (Ont. Gen. Div.), at p. 478. Where codified expressions of professional scientific norms exist, they support my contention that a commitment to truth seeking is the *sine qua non* of scientific inquiry.

[37] Merton (1973) at pp. 270-278.

[38] The literature concerning the sociology of scientific knowledge is rife with examples that reveal the practice of science to be a much more human endeavour replete with apparent departures from virtually all

scientific practice do not insulate the scientist from social influence they do represent a professional commitment to truth seeking. Adherence to these norms is inculcated within the scientist through his scientific education and his participation within the scientific community.[39] Social mechanisms such as the inability to secure support for funding, derision within the community and its system of peer review and publication, and occasionally ostracism, serve to sanction those that depart from the norms within their professional endeavours.[40] The myth is thus useful from our standpoint as it discloses one significant divergence in the professional norms of law and science. The lawyer who, within the limits set by his professional ethics, advances his client's interest at the expense of the truth violates no professional norms, whereas the scientist who is seen to abandon any interest in the truth of his claims departs from the *sine qua non* of his profession.

The scientist testifying in court is, in our system of law, almost necessarily partisan. I have already noted that under the adversarial model lawyers play the active role in presenting the evidence that they hope will persuade the trier of fact - and that in this role the lawyer generally owes no positive duty to the truth. This raises the concern that the scientist, no longer functioning within his community, may be systemically induced to depart from his professional norm of truth seeking in ways that confound the

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of the professional norms that Merton identifies. See, for example, the case studies of Collins and Pinch (1993).

[39] Kuhn, (1987), at p. 254.

[40] See, for example, Barnes, B., (1985) at pp. 37-71; Kuhn, T., (1970), at pp. 46-47. Kuhn goes so far as to assert that the individual who ceases to adhere to the commitments of his profession, as articulated by a paradigm that includes professional norms and methodological commitments, ceases to be a scientist. *Ibid.*, at p. 159.

epistemic goal of the legal inquiry.[41] Given the scientific norm of truth seeking, one may immediately discern departures arising from the courtroom use of the scientific witness. First, the scientist is no longer striving for the recognition of his peers; he is now a *paid partisan witness*. The system of peer review and publication, with advancement through recognition, is supposed to insulate the scientist from monetary incentives that might lead to an interested stake in the outcome of the scientist's labours. In the legal arena, however, a party *hires* the scientist because his opinion will be useful in establishing the desired factual determination; the scientist is paid for and produced with a clear result in mind. Secondly, the result-oriented goal of presenting the scientific witness marks a departure from the form of inquiry that one finds in non-commercial scientific research. A trial must produce a factual determination in the here and now; legal inquiry does not have the luxury of an extended period of inquiry such as one typically finds in pure scientific research. The lawyer producing the scientist desires testimony that will, as strongly as possible, support his theory of the case. Hypotheses that are couched tentatively or speculatively – perhaps because the research is ongoing – are of little use to the lawyer.

An experienced or scrupulous expert witness can often reconcile the contrasting norms of law and science and maintain his scientific professionalism. The pressures of the adversarial contest and the desire to deliver what a party to the proceeding wants can, however, induce the expert to depart from the norms of his community and adopt the more partisan norms of the law; for example, by wording his testimony more strongly

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[41] Jasonoff notes that it is part of the "boundary maintenance between science and the law" that science emerges as, "unswervingly committed to the truth, while the law is shown as intent on winning adversarial

than he would for a peer reviewed journal.[42] The following example illustrates how this can easily happen in the back-and-forth questioning of the courtroom:

> In a Missouri case, an expert testified that trace evidence has the "same blood types and same DNA profile as Mr.Davis." But when the prosecuting attorney restated this testimony as "the staining on the lower part of the jacket that you identified as Jack Davis's blood," the expert made no effort to correct this subtle distortion. Likewise, when the expert stated that a particular blood stain was "consistent with Mr. Davis's," the prosecuting attorney interrupted to ask "Which one consists of Mr Davis's?" Rather than explain that there is an important difference between blood that is consistent with Mr. Davis's and blood that *is* Mr. Davis's, the expert simply answered the misleading question.[43]

This example, from *State* v. *Davis*,[44] is an example of the "prosecutor's fallacy" - or the fallacy of the transposed conditional. It consists in conflating the probability of some relevant statistical correlation, the probability of a DNA match in a given population for example, and the probability of innocence. The lawyer's persistent mis-statement of the DNA evidence in this exchange eventually wears down the witness, whether through inattention, frustration with explaining himself, or a desire to yield the response the prosecutor desires. Instead of an accurate representation of the scientific evidence, the trier of fact is presented with the misleading impression that the scientific evidence conclusively establishes the accused's identity.

The possibilities for departures from scientific professional norms do not stop with testimonial slips of the tongue. It is also possible that the scientist may wilfully depart from the norms of his profession because he identifies with the objectives of one party in the litigation:

> Courtroom controversies often implicate decisions that will affect the quality of life in our society, such as, what products should be allowed on the market, what substances

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games at any cost." Jasonoff (1995), at p. 6.

[42] Burk (1993), at p. 369.

[43] Koehler (1993), at p. 31.

[44] *State* v. *Davis*, 814 S.W.2d 593 (Mo. 1991).

> should be released into the environment, and what evidence should be employed to prove criminal conduct. Scientists, like everybody else in society, may have strong opinions regarding which resolution of such disputes is most desirable. The desire to see a particular outcome may cause a scientist to abandon the norms of science, coloring his testimony to see his particular viewpoint furthered.[45]

In Chapter 1, I noted the example of Dr. Grigson, the Texas psychiatrist who boasted of his ability to 'sell his views to the jury' and to 'set traps for the defence' in the effort to secure death penalty sentences for the prosecution.[46] This sort of phenomenon raises the well-known concern over the use of experts as 'hired guns' - experts who will wholeheartedly adopt the adversarial norms of the law presenting, and possibly misrepresenting, their science in a reckless pursuit of victory. A similar concern arises when scientists seek to utilize the courtroom as a venue for airing fringe science. As in the 'hired gun' scenario, the testifying expert's personal motivations for testifying are overtly partisan. In this sort of scenario though, the expert whose conjectures find scant reception within his scientific community seeks to achieve the attention and recognition of the legal system as a means of circumventing his professional community.[47] Once again, partisan motives may lead such an expert to depart from the veritistic commitments of his profession and frame his testimony in a manner that misleads the trier of fact as to the reliability of the testimony or as to what propositions the testimony actually supports.

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[45] *Ibid.*

[46] See Chapter 1, at p. 31 above. Gianelli (1993), at p. 115. There are more notorious examples of science in the court that actually slip the boundary into overt fraud. In *Buckley* v. *Fitzsimmons*, 113 S. Ct. 2606 (1994) an accused exonerated of murder charges sued his prosecutor in civil court for wrongful prosecution. The principal evidence in the criminal matter was a bootprint at the crime scene. Allegedly, the prosecutor had tried and failed to secure a connection between the bootprint and the accused's boots at three separate forensic laboratories. Eventually, after much expert shopping, the prosecutor secured the desired expert testimony from a forensic expert, "known for her willingness to fabricate unreliable expert testimony." See Loevinger (1995), at p.187, fn.168.

[47] *Ibid.*, at pp. 369-370.

The last few examples that I have considered demonstrate how the very language of science can also facilitate the ability of experts to knowingly push beyond their professional norms.[48] Let's consider this point further. We can most obviously identify a problem in such circumstances where the expert testimony exploits the relative scientific illiteracy of the lay trier of fact to misrepresent scientific conclusions or to advantage an unreliable opinion. This can be as simple as presenting unreliable hypotheses in scientific jargon. Combined with the mantle of the scientific expert's authority, and scientific sounding language, the danger is that the trier of fact will conflate, "the particularized views of an individual who has the credentials of a scientist with general, objective, scientific truth."[49] A misrepresentation of scientific evidence that is common within U.S. tort litigation trades on *post hoc, ergo propter hoc* deductions.[50] In this scenario scant anecdotal evidence that is suggestive of a relation of cause and effect, presented through the authority of scientific expert, trades on the susceptibility of laypersons to detect correlations that are either not present or not sufficiently warranted by the existing evidence.

Much of science is expressed in statistical terms. Statistical analysis is of particular importance in much forensic evidence that appears in court, for often this evidence is only meaningful if one understands the base rates, error rates, and interpretations involved in forensic tests.[51] Numerous studies since the well-known work

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[48] I should note, however, that the use of scientific jargon in court is a double-edged sword; see Section 3.5.

[49] Foster and Huber (1997), at p. 216.

[50] *Ibid.*, at p. 211. Foster and Huber note the string of silicone breast implant litigations in the U.S. as an example.

[51] Thompson (1989), at p. 7.

of Kahneman and Tversky[52] have demonstrated that laypersons have difficulty understanding and evaluating statistical evidence.[53] In an English case, for example, the English Court of Appeal considered the use of Bayes Theorem by the jury to evaluate the evidence, scientific and non-scientific, adduced at trial. Writing for the majority, Chief Justice Lord Bingham wrote,

> We do not consider that they [the jury] will be assisted in their task by reference to a very complex approach which they are unlikely to understand fully and even more unlikely to apply accurately, which we judge to be likely to confuse them and distract them from their consideration of the real questions on which they should seek to reach a unanimous conclusion.[54]

I have already noted the commonplace prosecutor's fallacy in discussing how experts may sometimes adopt misleading positions in the context of an adversarial proceeding.[55] The use of statistics offers other possibilities for trier of fact error or misdirection beyond the prosecutor's fallacy. It will be useful to consider one example in greater detail.

The use of base rates is common in much forensic evidence and provides a good example of the potential sources of lay trier of fact difficulty in assessing statistical arguments. Base rates measure the frequency that events or characteristics obtain within a given population and, combined with other evidence, are utilized to determine the value of the forensic evidence.[56] The value of base rate statistics depends, however, on factors that are not well understood by laypersons. Research indicates that laypersons are prone

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[52] See, for example, Kahneman and Tversky (1973), (1974) and (1983).

[53] See Fienberg and Schervish (1986), at p.785; Thompson (1989), at pp. 29-40; and Fienberg, Krislov, and Straf (1995), at p. 7.

[54] *Denis Adams (No.2)* [1988] 1 Cr. App. R., at p. 385.

[55] Thompson, citing one study in which the subjects were presented with statistical arguments that involved both the prosecutor's fallacy and a fallacy on the part of defence, notes that 29% of the subjects thought the prosecutor's fallacy was correct, while 68% thought the fallacious defence argument was correct; Thompson (1989), at pp. 32-33.

to ignoring base rates and insensitive to the significance of these rates.[57] Thompson notes three sources of error in trier of fact evaluation of base rates. First, the value of base rates depends upon the accuracy and quality of the data utilized to generate them. Bias in the sampling or insensitivity to regional variations can yield inaccurate base rates; considerations that often escape laypersons.[58] Secondly, laypersons tend to be insensitive to the difficulties that can arise when statistical arguments involve multiple characteristics. Where these characteristics are independent one utilizes the product rule to generate the joint frequency of their occurrence. Where, however, the characteristics under consideration are not independent the use of the product rule will underestimate the frequency of joint occurrence.[59] A third difficulty that can arise from lay insensitivity to base rates in statistical arguments concerns the value of associative evidence and the selection criteria of the subject (e.g. an accused) individual. Where one selects the subject of the statistical argument on the basis of reasons that are unrelated to the likelihood of matching the subject to the perpetrator, the use of base rates will allow for an estimate of the likelihood of a coincidental match within the given population between characteristics possessed by the subject and matching characteristics (e.g. blood type) of the perpetrator. If, however, the subject is selected precisely on the basis of characteristics that render it more probable that these characteristics will match those of the perpetrator, then the frequency of the characteristic within the general population will not be representative of

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[56] *Ibid.*, at pp. 10-11. For example, suppose that there is forensic evidence that the blood type of the accused matches the blood type of the perpetrator. Base rates would be relevant to assessing the significance of this evidence by establishing the frequency of that blood type in the relevant population.
[57] See Feinberg and Schervish (1986), at p. 785, and Thompson (1989), at pp. 36-38.
[58] Thompson (1989), at p. 15.
[59] *Ibid.*, at p. 16.

the probability of a coincidental match.[60] A California case, *People* v. *Collins*,[61] in which the prosecution sought to support weak identification evidence by introducing expert statistical evidence purporting to show the frequency of, "a black man with a beard and a mustache and a blonde woman with a ponytail... in a yellow convertible" – features possessed by the defendants in the case – is often cited as an example.[62] It should come as no surprise that the defendants matched in this case, since they were selected precisely on the basis of possessing the relevant characteristics of the perpetrator. As noted above, equally subtle lay errors are common in the evaluation of error rates and statistical interpretation as well. These difficulties provide avenues, as *Collins* illustrates, for utilizing statistical arguments presented through expert witnesses to mislead or confuse triers of fact.

3.5 The Adversarial System and Science: A Clash of Inquiry

The difficulty at the intersection of scientific and legal inquiry does not end, however, with the observation that lay jurors may easily be misled. There are epistemic difficulties that arise for lay decision-makers solely from the differences between legal and scientific inquiry. At the outset we must keep in mind the "mystique" that scientific authority has within popular culture, the belief that science provides certain knowledge largely immune from subjective influences, as well as the potential frustration or distrust of science that arises when science appears to depart from this myth of objectivity and

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[60] *Ibid.*, at p. 17.
[61] *People* v. *Collins*, 68 Cal. 2d 319 (1968).

certainty.[63] While legal and scientific inquiry both seek "intellectual support for some conclusion or proposition," there are differences in the object and, more importantly, the language and expectations of proof employed by these forms of inquiry.[64] In a legal dispute the fact-finder seeks to determine the facts surrounding the particular past event that is the subject of the controversy, whereas much scientific inquiry concerns establishing general facts of nature and nomological regularities.[65] Legal inquiry predates the employment of science in the courtroom; it evolved in the context of testing lay testimony to resolve lay disputes. The vast majority of evidence that appears in a courtroom consists in lay testimony expressed in verbal terms and evaluated in light of categorical standards of proof that pattern the evaluation of evidence in ordinary lay contexts. Within scientific inquiry, however, evidence is largely expressed numerically, "stating degrees of probability or confidence."[66]

In order to obtain a sense of the problems arising from the contrast between lay testimony and scientific testimony, let's utilize two pieces of testimony; one a fictional example of lay identification testimony, and the other a real sample of expert testimony concerning DNA evidence. First, the lay testimony:

> QUESTION: Were you able to get a good look at the robber?
> ANSWER: Yes, I was able to see him clearly.
> QUESTION: How tall was he?
> ANSWER: Under 6 feet tall.
> QUESTION: How heavy was he?
> ANSWER: He was heavy, almost fat, over 250 pounds.
> QUESTION: What race was he?

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[62] See *ibid.*, at pp. 17-18, and also Koehler (1993), at p. 32. The case is also cited as an example of a misuse of the product rule since the frequency was calculated by the expert on the unsupported assumption that the characteristics were independent; Thompson (1989), at p. 18.

[63] See Collins and Pinch (1993), at p. 142 for a discussion of this "flip-flop thinking."

[64] Loevinger (1992), at p. 323.

[65] *Ibid.*, at p. 328.

[66] *Ibid.*, at p. 333.

ANSWER: He was white.
QUESTION: And his complexion?
ANSWER: He was very fair, with freckles.
QUESTION: What color was his hair?
ANSWER: He was blond.
QUESTION: How was his hair cut?
ANSWER: It wasn't really cut at all - just sort of long and stringy.
QUESTION: Did he have any facial hair?
ANSWER: A small moustache.
QUESTION: Could you see his eyes?
ANSWER: Yes, he came right up to me.
QUESTION: What color were they?
ANSWER: Blue.
QUESTION: Was he wearing glasses?
ANSWER: Yes, he was.
QUESTION: What sort of frames?
ANSWER: Round wire rims.
QUESTION: Did he have any scars or marks?
ANSWER: Yes, he had a birthmark on his forehead.
QUESTION: was he wearing a jacket?
ANSWER: He had on a Toronto Maple Leafs jacket.[67]

Secondly, an example of scientific testimony:

QUESTION: And you were able to compile all four of those probabilities and determine what is the likelihood of the DNA found in Billy Glover just randomly occurring in some other DNA sample?
ANSWER: Yes.
QUESTION: What is the likelihood of that?
ANSWER: The way that is done is to multiply each one of those four numbers that I mentioned before together, because each one is separate and independent, and the final number comes out as one in about 18 billion.
QUESTION: So the likelihood that DNA belongs to someone other than Billy Glover is one in 18 billion?
ANSWER: That is correct.[68]

Consider the differences between the responses given to the questioning in each example. Notice that in the lay identification the witness' responses are categorical and expressed entirely in verbal terms: "his hair was blond," "his eyes were blue," etc.. In lay testimony one rarely expresses reports in terms of mathematically expressed

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[67] Lubet (2000), at pp. 65-66.

[68] *State* v. *Glover,* 825 S.W. 2d 127 (Tex. Crim. App. 1992). This exchange is interestingly another example of the misuse of statistically framed expert testimony – and one in which the expert either willingly or inadvertently participates. See Koehler (1993), at p. 30, and my discussion of the prosecutor's fallacy below at p. 94.

probabilities.[69] In instances where we believe we know, we report in terms that do not expressly admit degrees of confidence. To be sure, our lay observational judgments *actually are* fallible and lay testimony may disclose degrees of confidence that fall well short of the confidence expressed in the given example; e.g. "I think his eyes were blue," "I can't really remember what color his eyes were - maybe blue," etc.. We know, however, how to evaluate lay testimony, even when it is cashed out in terms that indicate uncertainty. Lay testimony, by and large, consists of the reporter's recollections of things and events that the reporter experienced. Each of us possesses our own store of observational experience as well as our own background experience in evaluating the testimony of others. It is this background and the ability to relate this background to the testimony of witnesses that, as discussed in Section 3.1, enables the lay trier of fact to arrive at credibility assessments concerning lay testifiers.

The techniques of adversarial questioning, as I note above, evolved in the realm of lay testimony, to test lay testimony regarding the past events that are under dispute. Effective questioning by counsel can assist triers of fact in bringing out of the witness the kinds of information that the trier of fact requires rendering his credibility assessment of the witness. The sample identification testimony related above provides one example of this. The exchange is an example of "incremental questioning." Note that counsel through a more general direct examination question could have sought the identification, such as, "What did the robber look like?" General questions will often, however, generate general responses that would omit much of the information that the lawyer in this example elicits

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[69] Of course, given sufficient training in the probability calculus, each of us likely could express beliefs in probabilistic terms.

through the use of the incremental questions.[70] Where, as in this example, the details are, "available, significant, and convincing" the technique can, "drive home the accuracy of the identification without seeming to put words in the witness's mouth."[71] The trier of fact, given such identification, is apt to be impressed by the witness' recollection of detail and the surety of the responses - all considerations that would weigh in favour of the witness as the trier of fact assesses his credibility with respect to the identification.

I noted above that the language of science is largely expressed numerically in terms of probabilities. The contrast between the hypothetical lay identification witness testimony and the testimony of the expert in *State* v. *Glover* illustrates this difference vividly. While the trier of fact can rely upon his own store of background knowledge and experience to evaluate the lay testimony, assisted by considerations emerging through effective adversarial questioning, in the case of the expert testimony a proper assessment depends upon understanding the meaning of the statistical arguments. The exchange cited from *State* v. *Glover* is representative of the difficulties involved. The prosecutor in this exchange asks first about F(traits), that is, the frequency of matching traits. Within the third question in the reported exchange, however, the prosecutor re-describes this value as a source probability, that is, the probability that the DNA belongs to somebody other than the accused.[72] This conclusion concerning the source probability, however, cannot be made absent an estimate of the size of the potential source population and other evidential assessments as well. The research that exists, some of which I noted in my discussion of

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[70] Lubet (2000), at pp. 65-66. This use of this technique, of course, must be carefully applied to avoid leading questions. Leading questions are those where the examining lawyer suggests the answer to his own question thereby 'putting words in the witness' mouth.'

[71] *Ibid.*, at p. 71.

statistical abuses, does not lend great confidence in the ability of most laypersons to understand or detect such errors in statistical argument. Beyond this consideration, we may also observe concerns arising from that fact that the probabilistically expressed language of science is not the categorical language of lay testimony. While scientific testimony can be misstated – the testimony of Dr. Grigson, noted above, would be such an example – to appear more categorical than it actually is, the use of appropriately expressed scientific testimony can also be exploited in adverse ways. Scientific knowledge is, by and large, empirical knowledge and its frequent expression in probabilistic terms explicitly conveys the uncertainty that is present in all empirical knowledge; uncertainty that the categorical language of lay testimony often obscures. This contrast can be exploited by the effective examiner to undermine lay assessments of scientific testimony – even reliable science – in ways that are injurious to the epistemic goal of legal inquiry.

How do the differences just explored, conjoined with the popular myth of scientific authority, pose a difficulty for the lay evaluation of scientific testimony? The difficulty arises from differences in language and proof expectations that can be exploited by the skilled examiner to raise doubt or confusion within the lay trier of fact concerning [even reliable] science. First, let's consider how these doubts arise. The sorts of phenomena studied by sociologists of scientific knowledge provide fertile ground for lawyers seeking to question scientific testimony. Science, we know, relies upon experimentation in order to garner inductive support for scientific hypotheses. This involves constructing tests under conditions that will permit discrimination between a

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[72] Koehler (1993), at pp. 30-31. The prosecution in *Glover*, I should note, resulted in a conviction.

confirming and a falsifying result; it may involve measurement and the use of instruments designed to detect certain phenomena and it will involve a human agent (or agents) who must properly conduct the test. Various sources of uncertainty will arise out of this practice. Suppose we have some phenomenon *q* that the experimenter *A* seeks to test for using instrument *X* and procedure *Y*. How do we know that *A* had the proper calibration of *X* or maintained the proper conditions *Y*? How do we know that human error or bias was not involved? How do we know that there aren't alternate explanations for the data observed? If the phenomenon *q* is experimental, that is, if the existence of *q* is at issue, how do we know that *X* and *Y* are reliable detectors of *q*?[73] Sociologists of scientific knowledge analyzing scientific debates note that the sorts of questions just canvassed here provide the pathways of attack that scientists will actually employ against each other.[74]

The avenues employed by scientists within their professional debates, and identified in the sociology of scientific knowledge literature, are also the routes for attack by the effective cross-examiner. In the courtroom venue, however, the cross-examiner seeks to demythologize the popular myth of scientific certainty and, by doing so, reap the greater weight for his attack that stems from the apparent frustration of that popular myth. Consider the following exchange between an advocate conducting the cross-examination of an expert concerning the reagent used in a drug identification test:

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[73] This last is what has come to be called "experimenter's regress." See Collins and Pinch (1993), at pp. 97-98. Some will suggest that phenomenon such as experimenter's regress are in principle impossible to escape. I leave the question of whether this is the case open. What matters for my purposes here is the perception of indeterminacy that the phenomenon discloses.

[74] Jasonoff (1992), at pp. 348-349. See, for example, the case studies reported in Collins and Pinch (1993).

Q. Then, after you put the one normal sulfuric acid in the container, what did you do next?
A. I then added approximately 6 cubic centimeters of sodium tungstate.
Q. You got that out of a container also that was prepared?
A. I do not recall.
Q. Did you check it on the sixth to see if it was sodium tungstate?
A. I don't remember checking it on that date.
Q. Do you remember checking it on the day before?
A. No, sir.
Q. How big of a container was that?
A. This is also - well this is a slightly smaller container, I do not know. Approximately 300-millimeter container.
Q. How was the solution prepared?
A. It is merely a 10 percent solution.
Q. What if it is stronger? What if it is a 20 percent solution - will it change the result of the test?
A. I don't know. I have never experimented.
Q. According to the specifications you have for the test, you need 10 percent solution, don't you?
A. Yes.
Q. And you never checked this to find out if it was 10 percent solution?
A. Not after the original preparation of the material, no.
Q. You didn't prepare it yourself, as far as you remember?
A. I don't recall whether I did or not.[75]

The lawyer's cross-examination tactic in this exchange is to raise doubt in the trier of fact concerning the materials used in the test. The lawyer does so by eliciting the following information: (1) prior to the test the expert did not check to determine that he was using the proper reagent; (2) having the proper reagent is part of the specifications of the test; and (3) the expert is unsure whether he even prepared the reagent. The questioning lawyer wants the trier of fact to infer that the success of the test depends on the employment of the proper reagent, hence the questioning to elicit (2), and infer from the expert's inability to confirm that the proper reagent was employed, (1) and (2), that we cannot be confident of the test result. The cross-examiner in this example is exploiting the same uncertainty that arises within scientific debates when one questions the procedures, materials, etc., utilized in a scientific test in order to cast doubt on the hypothesis or the results obtained.

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[75] Imwinkelreid (1997), at p. 340.

Virtually all of the aspects of experimental practice that sociologists of scientific knowledge look to when deconstructing the myth of scientific objectivity, the preparation of materials and instruments, the employment of proper test environment, the employment of proper procedures, the interpretation of test data, are available for the legal inquirer to cast doubt on scientific testimony. One should not take this to mean that science cannot yield knowledge or that, as a form of veritistic inquiry, science is no more objective than non-science. What it does mean is that there is a gap between layperson expectations that track the myth of scientific objectivity and what actually is the case within scientific practice. The inquirer who is acquainted with the fact that these uncertainties are normal features of scientific inquiry is in a position to judge the weight that should be accorded them when they emerge in a particular case. The layperson, however, typically lacks this understanding of actual scientific practice and is therefore more prone to misunderstand the significance of these features.

Sometimes the bare fact that science is a fallible human practice is sufficient to prompt the unfavorable trier of fact responses that the lawyer seeking to undermine the scientific testimony in question desires. Consider the following hypothetical example of the cross-examination of a breathalyzer expert.

> Q. Now, Officer Dixon, this breathalyzer which you have described to the jury, it is an electrical device, isn't it?
> A. Well, actually it works on mechanical principles.
> Q. You have to plug it into the wall to make it work, don't you?
> A. Yes.
> Q. Essentially then, it is an electrical machine - an appliance - like a washing machine or a toaster, except it is more complex; isn't that correct?
> A. Yes.
> Q. And you say, if I understand your testimony, it is relatively foolproof?
> A. Yes, if properly run, it is foolproof.
> Q. In other words, it never malfunctions if it has not been abused; is that correct, officer Dixon?
> A. Yes.

Q. Like a toaster?[76]

The examiner in this exchange seeks to elicit the expert's admission that the breathalyzer is a piece of technology that depends on proper use by the human agent in order to yield a proper result - presumably to cue further testimony that may suggest that the device was not properly used in this instance and thereby cast doubt on the results. The examiner interestingly likens the device, and the agent-centred difficulties that may arise from its operation, to that of a household appliance. The analogy is purposefully construed to deflate the belief that technology with a scientific end is somehow more reliable, or less prone to human error, than any other piece of human technology. To the extent that the lay trier of fact comes to trial with expectations informed by the myth of scientific certainty, and bereft of any understanding of the uncertainties that are normal features scientific practice, the weight accorded to such uncertainties when they are exposed may be disproportionate to the weight actually deserved.

3.6 Conclusion

The proponent of the inclusionary approach is content to place his faith in the adversary system in order to resolve the issues of reliability that arise with respect to scientific testimony. When pressed with concerns such as the use of unreliable science, or the 'battle of the experts,' the proponent suggests that good adversarial questioning by the parties' counsel should suffice for triers of fact to render weight determinations.

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[76] *Ibid.*, at p. 345. I use this as an example of the form of questioning rather than as a statement of the present state of the law. Section 258 of the *Criminal Code* now provides a presumption that, in the absence of evidence to the contrary, samples taken by an approved breathalyzer are proof of an accused's blood alcohol content. That is, the device is presumed accurate and the burden shifts to the defence to provide evidence to the contrary.

Scientific testimony, it is contended, is, "more amenable to scrutiny than is the situation with lay witnesses." In this chapter I have set out how the principles of testimonial justification, developed in Chapter 2, are employed within legal inquiry. I submit that, *given the heightened justificatory requirements of legal inquiry*, a purely inclusionary approach to scientific testimony cannot suffice to provide triers of fact with the means to render justified beliefs with respect to such testimony. Two objections figure in this conclusion. First, on principle, the courtroom inquiry alone cannot provide the trier of fact with the requisite background that would be needed to meet this justificatory threshold. Secondly, the differences between legal inquiry and scientific inquiry can thwart the trier of fact's task, whether through subversion of the witness' scientific norms in favor of adversarial norms, or through the application of lay standards and expectations of proof to scientific propositions. If the concerns regarding scientific testimony canvassed in Chapter 1 are to be addressed in a manner that does satisfy the epistemic needs of the law, then we must look to one of the other candidate responses to show us the way.

Chapter 4 - The Exclusionary Approach

In this chapter I shall be considering the 'exclusionary approach' to expert scientific opinion evidence. In Chapter 3, I argued that a purely inclusionary approach to this form of evidence fails to satisfy the epistemic needs of the law. In the context of a legal dispute, our epistemic duty demands greater emphasis upon error avoidance and hence requires that fact finders possess positive reasons or warrant for their findings of fact. This demand, however, raises the problem of expert testimony in that the trial context cannot be expected to provide triers of fact with the resources to adequately assess evidence of this nature in such a way as to possess positive justification. The exclusionary approach purports to remedy this by ensuring that if such evidence is to come before a trier of fact, it will at least meet some threshold of reliability and probativeness counterbalanced against the possible epistemic dangers of the evidence. My examination of this approach will: (a) commence with an analysis of the approach and the goals that any viable application must satisfy, and (b) critically review applications of this approach extant within U.S. and Canadian case law.

4.1 The Rationale of the Exclusionary Approach

In Chapter 1, I noted that exclusionary rules within the law of evidence are often motivated by epistemic paternalism. Where there are considerations in the nature of the evidence that call into question the ability of the trier of fact to adequately assess the evidence, the law provides for the exclusion of such evidence to 'protect' or 'shield' the fact finder's deliberative process. These rules therefore allocate to the trial judge what the

U.S. Supreme Court describes as a "gatekeeping role"[1] whereby the court may paternalistically exclude offending evidence from the consideration of the fact finder. The procedural basis for the exclusion of any given category of problematic evidence may vary from jurisdiction to jurisdiction. Sometimes law provides for the exclusion of such evidence through a target specific evidentiary rule, common law or statutory, and in other instances exclusion may arise under the auspices of a more general exclusionary power such as a judge's inherent discretion to exclude evidence where the prejudicial effect of the evidence is deemed to outweigh its probative value.[2] Regardless of the precise procedure involved, the underlying rationale with these epistemically motivated rules is the same: to protect the fact finder from forms of evidence injurious to the epistemic aims of the process.

How could an exclusionary approach to expert scientific opinion evidence assist the law in responding to the epistemic problem posed at the conclusion of Chapter 3? Recall that the problem stemmed from the specialized nature of this form of testimony and the epistemic threshold for warrant demanded by the law. I argued that the legal

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[1] *Daubert* v. *Merrell Dow Pharmaceuticals, Inc.*, 113 S.Ct. 2786 (1993), at p. 2798.

[2] The common law hearsay rule, and its many exceptions, provides an example of a target specific exclusionary rule. Hearsay is, "an assertion other than one made by a person while giving oral evidence in the proceedings" and (subject to various exceptions) will be, "inadmissible as evidence of any fact asserted." The House of Lords, in explaining the rationale for the rule, cites the Privy Council decision in *Teper* v. *R.*:

> It [the hearsay evidence] is not the best evidence and it is not delivered on oath. The truthfulness and accuracy of the person whose words are spoken to by another witness cannot be tested by cross-examination, and the light which his demeanor would throw on his testimony is lost....
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> *R.* v. *Kearley* [1992] 2 All E.R. 345 (H.L.), at p. 363.

Documentary evidence may constitute hearsay as well; see, for example, *R.* v. *Lal* (1979), 51 C.C.C. (2d) 336 (B.C.C.A.). The hearsay rule underscores the account of testimonial justification articulated in Chapters 2 and 3. Because there can be no credibility assessment of the out of court statement offered, factual determinations on the basis of such evidence would lack justification. The hearsay rule therefore

system prioritizes error avoidance and so requires that triers of fact understand and possess the credibility assessments upon which determinations of fact are made.[3] This poses a problem for expert testimony in that jurors cannot be expected to possess this form of internalist justification for such specialized credibility assessments in the course of an adversarial trial. If the expectation for the exclusionary approach is that it should overcome this problem by ensuring that jurors do possess the desired threshold of warrant, then the short answer to the question posed must be that this approach cannot assist the law. The fault is endemic to this type of testimony deployed in a legal context that relies upon judgment informed by lay knowledge alone - layperson juries or generalist judges. Suppose, for example, that some piece of proposed expert scientific testimony does meet whatever exclusionary standards exist, and suppose too that those standards actually are adequate to the requirements set out in Section 4.2. This evidence goes before a fact-finder. Is the legal fact-finder now in any better position to epistemically assess the merits of the evidence and form beliefs that possess the desired justification? We must conclude that the fact-finder is not, for its epistemic position remains unchanged. The lay fact-finder in this scenario still lacks the knowledge and expertise that would allow for the credibility assessment needed to justify beliefs formed on the basis of the expert testimony.

A judgment that the exclusionary approach should be dismissed because it does not *solve* the problem of expert testimony is, however, too peremptory. Provided that the

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provides a target specific exclusionary rule that aims to shield jurors from forming factual determinations on the basis of such evidence.

[3] I am using the nomenclature 'credibility assessment' to refer to the positive assessment of a reporter's testimony described in Chapter 2, Section 5. This should not be confused with what, in legal terms, is

criteria selected for exclusion are satisfactory this approach can assist in responding to the problem by *mitigating* the dangers posed by this form of evidence. An exclusionary approach provides the trier of law with the ability to screen the putative evidence and reach a preliminary determination of its epistemic merit counterbalanced against its potential danger prior to the submission of the evidence to the jury. This arguably ensures that the evidence meets an epistemic threshold such that, should the triers of fact rely upon the evidence, doing so will not be apt to impugn the epistemic merits of their factual determination.[4] The court and the courtroom process functions in this instance as a kind of epistemic guardian, first ensuring that the evidence meets the requisite threshold. Should the trier of law apply the test and reach the determination that the evidence is *injurious* to the jury's epistemic task the evidence is excluded and the problem of expert testimony never arises.[5] On the other hand, should the evidence satisfy the standard for admissibility provided by the exclusionary test the trial process as a whole, a process that includes this judicial deliberation as to admissibility, may be deemed to satisfy the epistemic needs of the law. While the jurors remain epistemically dependent on the expert the legal *process* of first screening the evidence has ensured that this dependence is not misplaced. The reader will readily note that this rationale depends upon a satisfactory

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described as witness credibility (although the sorts of factors contributing to the legal sense of credibility certainly are coextensive).

[4] The exclusionary approach therefore aims to ameliorate the first problem associated with expert testimony that was articulated in Chapter 1: triers of fact relying upon unreliable science. The other problems associated with expert testimony, and identified in Chapter 1, shall be addressed further in Chapter 7.

[5] I shall be utilizing the term "injurious" here to capture the notion of expert scientific testimony that fails to meet the threshold of an exclusionary test. There are different ways to capture the notion of expert testimony that is epistemically dangerous to the evaluation of the trier of fact (e.g. one could key on the notion of "scientific" or "reliability" or "uncertainty" to attempt to articulate standards of admissibility) and at this point we should not assume that all are equivalent or prejudge a determination by speaking in terms

basis for exclusion that can be wielded adequately by a judge. Let us turn then to consider the *desiderata* of an exclusionary test for expert scientific opinion evidence.

4.2 The Success Conditions for the Exclusionary Approach

In order to evaluate the prospects for the exclusionary approach, it is necessary to begin by establishing some success conditions for any such test that we might contemplate. Intuitively the *desiderata* for a legal test of this sort would seem to involve two considerations. We would first expect that such a standard should accomplish the epistemic end for which it has been designed. This is evident from the fact that there is a clear epistemic end in sight here - namely the shielding of jurors from testimony injurious to their epistemic task. By this I mean that the test should be *principled.* Secondly, any standard deployed should be practicable in the legal context; it must be the sort of standard that a trial judge could actually apply. This is evident from the fact that the context in which the means to be applied, a test, involves the application of that means by a trier of law. This last consideration imports a notion of cognitive cost into the evaluation and, following Goldman, I will term this requirement an "efficiency" standard or goal.[6] Satisfaction of both these conditions, that the test is principled and efficient, is necessary and sufficient for a successful exclusionary test.

We need to be clear about what these two success conditions entail. Consider the notion of a principled test. The exclusionary standard adopted must be *specific* enough to be capable of rendering the appropriate distinctions between injurious opinion evidence

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suggestive of any particular standard. Since all such standards attempt to capture the notion of evidence that is 'injurious' in some manner to the epistemic task of the juror I will utilize this term for the moment.

and non-injurious opinion evidence. Assuming that an objective measure of 'injurious' opinion evidence can be made out, we should not, barring judicial error and human fallibility, be able to isolate instances where the application of the standard would result in the inclusion of injurious opinion evidence or the exclusion of non-injurious opinion evidence. Secondly, the exclusionary standard adopted must be capable of *reasonably consistent* application. Once again barring judicial error and the limits of fallible knowledge, we should not be able to demonstrate that the same standard, applied in different instances with similar evidence and context, could regularly result in different evidential assessments. Finally, the standard sought must be *broad* enough to be capable of rendering evidential assessments over the disparate variety of scientific disciplines - both human sciences and the natural science - that could potentially serve as evidence in a courtroom. These three considerations, specificity, consistency, and breadth, are the measures of what I term a principled exclusionary test.

What is meant by an efficient exclusionary standard? As I alluded to above, an efficiency standard invokes the element of cost. We ordinarily conceive of cost in pecuniary terms and certainly the acquisition of knowledge often does have an associated economic cost. What is meant here, however, is a more expansive notion of cost that encompasses cognitive costs as well.[7] That is, the investment of cognitive resources and labour in the acquisition of knowledge. Goldman notes that, "More efficient practices are

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[6] Goldman (1987), at p. 129.

[7] See, for example, *R.* v. *Mohan* (1994), 89 C.C.C. (3d) 402 (S.C.C.). The Supreme Court notes, at p. 411, "Evidence that is otherwise logically relevant may be excluded on this basis.... if it involves an inordinate amount of time which is not commensurate with its value...."

ones that promote answer-acquisition at lower cost."[8] In the legal context under consideration we desire an exclusionary standard that is efficient in these terms. We must therefore inquire into the cost considerations that feature in the court's search for truth.

There are three principal concerns that relate to the efficiency of a legal standard such as we shall be considering in this chapter. First, there is the financial cost of the procedures employed. This may arise simply as a matter of the extension of the court time needed to resolve a dispute by the addition of legal argument concerning these evidentiary issues, or it may arise through the associated costs of new and specialized procedures (for example, the introduction of independent court-appointed experts). The trial process already imposes a burdensome expense upon its participants (including the state). A more efficient standard should not expose the system to added economic costs without demonstrative and substantial epistemic gains. Secondly, it is important to remember that the legal pursuit of truth is subject to constraints that are different from other contexts of discovery; for example, the pursuit of truth in academic settings. The majority judgment in *Daubert* expresses this well:

> Yet there are important differences between the quest for truth in the courtroom and the quest for truth in the laboratory. Scientific conclusions are subject to perpetual revision. Law, on the other hand, must resolve disputes finally and quickly. The scientific project is advanced by broad and wide-ranging consideration of a multitude of hypotheses, for those that are incorrect will eventually be shown to be so, and that in itself is an advance. Conjectures that are probably wrong are of little use, however, in the project of reaching a quick, final, and binding legal judgment - often of great consequence - about a particular set of events in the past.[9]

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[8] *Ibid.*, at p. 129. Goldman gives the examples of conservation of costs through the use of collaboration and a division of labour. For a more extensive discussion of the division of cognitive labour and its associated veritistic qualities, see Kitcher, P., "The Division of Cognitive Labour" *Journal of Philosophy* 87 (1990) 5-22.

[9] *Daubert* v. *Merrell Dow Pharmaceuticals, Inc.*, 113 S.Ct. 2786 (1993), at p. 2798.

The law is not simply a search for truth; it is also an expression of justice. Justice, as the U.S. Supreme Court notes here, requires a relatively swift and final determination of disputes. An exclusionary standard that would involve a court in time consuming deliberations will therefore be inefficient unless demonstrable and substantive epistemic gain accompanies the added time. The reasons for added time associated with an exclusionary approach may vary. Added time may stem from a purely procedural standpoint, but it may also stem from added complexity in the application of the standard itself. Even assuming that there is compensatory epistemic gain, there is apt to be a point beyond which no added epistemic gain will compensate for added time. For example, we can imagine a process that is 100% reliable, but which would add years to the deliberative process. In the legal context, where disputes must be resolved quickly, such a process would be inadequate to the needs of justice.

Judges are experts of a sort. The expertise that we call upon judges to exhibit is that of legal expertise. We expect them to possess an expert knowledge of the law and its application. It is important to note, however, that judges are usually no more possessed of scientific expertise than the layperson.[10] This introduces a third important efficiency consideration. The exclusionary standard that the law employs must not be so complex as

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[10] There is an anecdotal instance within English jurisprudence involving statistical evidence that amply illustrates this consideration of interdisciplinary judicial expertise (or lack of it). In the case of *R.* v. *Adams* the Court was presented with expert opinion evidence concerning Bayes' Theorem; the defence in this case sought to adduce the evidence of the statistician to prompt the jury to utilize Bayesian statistical analysis in their evaluation of the other evidence adduced at trial (DNA evidence and alibi evidence). In order to explain Bayes' Rule the defence expert, Peter Donnelly, arranged a special tutorial session with the judge and jury replete with calculators. Donnelly reflected that his value to the defence "went negative" when, while going through an example with the judge and jury, he asked whether each "now had the numbers 3.45 showing on his display?" The jury agreed while the judge asked, "Why does mine say zero?" (personal communication between Teddy Seidenfeld and Oliver Schulte). For the appeals decision on this case and the admissibility of Bayes' Theorem see, *Dennis Adams (No. 2)* [1998] 1 Cr.App.R. 377.

to require the trier of law to exhibit an expertise that is not possessed by the trier of law. The standard itself may be complex in the sense of the breadth of analysis and the steps of reasoning involved.[11] If, however, the application of the standard calls upon the trier of law to render judgments beyond his expertise then it merely transposes the problem of expert testimony from the trier of fact to the trier of law. Chief Justice Rehnquist succinctly stated this concern about the expertise required of judges in the application of exclusionary standards in his dissenting judgment in *Daubert*:

> I defer to no one in my confidence in federal judges; but I am at a loss to know what is meant when it is said that the scientific status of theory depends on its "falsifiability," and I suspect some of them will be, too.[12]

The *Daubert* decision, which will be discussed in section 4.3, included "falsifiability" in the grocery checklist of factors that a trial judge should consider when evaluating whether some piece of opinion evidence is properly 'scientific.' The majority decision cited Popper's well-known *Conjectures and Refutations* for this claim.[13] It is far from clear that this Court, or the trial judges that are invited to consider the 'falsifiability' of a theory in making a determination of whether to exclude scientific opinion evidence, have any understanding of what this criterion actually means, the problems associated with it, or the extent to which it actually would provide a basis for demarcation. An exclusionary test couched in unfamiliar or complex terms, whose fair application would necessitate background knowledge not commonly possessed, is an invitation to judicial confusion. It is therefore inefficient in the cognitive terms we are considering. A viable exclusionary

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[11] Legal tests often are complex in this sense. Consider, for example, the chain of deliberation that a judge must go through to determine whether a piece of legislation that violates a right under the *Canadian Charter of Rights and Freedoms* is justifiable under section 1 of the *Charter*.

[12] *Daubert* v. *Merrell Dow Pharmaceuticals, Inc.*, 113 S.Ct. 2786 (1993), at p. 2800.

[13] *Ibid.*, at pp. 2796-2797.

test must therefore offer sufficient guidance to enable triers of fact to understand and apply the proposed criterion.

4.3 Applications of the Exclusionary Approach: U.S. Case Law

Now that we have articulated criteria for evaluating exclusionary schemes regarding expert scientific opinion evidence, let's consider some instances. In this section I will review the U.S. and Canadian case law that provides for exclusion of this form of evidence, focusing on the decisions of *Frye* v. *United States, Daubert* v. *Merrell Dow Pharmaceuticals Inc., R.*v. *Mohan,* and *R.* v. *J.-L.J.*. My aim will be to assess each of these exclusionary approaches in light on the principled and efficiency criteria articulated in Section 4.2.

The U.S. Case Law: *Frye* v. *United States*

I shall commence with the leading cases that set out exclusionary standards for scientific opinion evidence within the United States. The U.S. jurisprudence on this issue is much more extensive, as is the scholarly attention, than one finds in other common law countries.[14] The reasons for this are varied and we can likely trace them to the early articulation of *scientific* opinion evidence as a specialized category of opinion evidence, greater litigiousness,[15] and I suspect, greater and earlier applications of scientific opinion

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[14] The United States Supreme Court observed in *Daubert* that the scholarly debates over *Frye* within legal literature had become "such an established part of the academic landscape that a distinct term - "*Frye*-ologist" - has been advanced to describe those who take part, see *Daubert* v. *Merrell Dow Pharmaceuticals, Inc.,* 113 S.Ct. 2786 (1993), at p. 2793, footnote 4.

[15] In the United States this litigiousness manifests itself, for example, in a much more active civil bar than one finds in Canadian jurisdictions. This consequently yields greater opportunity for the articulation of legal principles in civil cases. In Canada one finds the issues surrounding expert scientific opinion evidence

evidence within the courtroom. The U.S. case law is therefore extremely fruitful for analysis and has provided much of the backdrop against which Canadian courts approach the issue.[16] Understanding the U.S. jurisprudence in this matter is therefore indispensable to any analysis of the evolution of Canadian law concerning the interplay of law and science.

The natural starting place for a discussion of the U.S. jurisprudence is the 1923 Federal Appeals Court decision of *Frye* v. *United States.* This decision marks the point in U.S. jurisprudence where we can clearly identify the emergence of the notion of *scientific* opinion evidence as a unique category of opinion evidence with its own specific standard for admissibility.[17] Prior to *Frye* it was well accepted that scientific opinion evidence was admissible if it relates to matters at issue in the trial that rest beyond lay knowledge or experience.[18] There was, however, no specific standard for admissibility beyond what we would characterize as relevance, necessity to assist the trier of fact, and the proper qualification of the expert. Indeed, in the earlier U.S. Supreme Court decision of *Davis* v. *United States,* the court rejected testimony that sought to support the scientific credibility of two medical witnesses by providing evidence as to the widespread acceptance of the witnesses' theory within the relevant scientific community.[19] It would seem then that U.S.

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arising predominantly in criminal cases - indeed, in Canada, most development within the law of evidence arises from criminal cases.

[16] See, for example, the discussions of the American jurisprudence on this issue in *R.* v. *Medvedew* (1978), 43 C.C.C. (2d) 434 (Man.C.A.), *R.* v. *Doe* (1986), 31 C.C.C. (3d) 353 (Ont. Dist. Ct), and more recently in *R.* v. *J.-L.J.*[2000] 2 S.C.R., 600.

[17] Loevinger (1995), at p. 158.

[18] The Court in *Frye* acknowledges this citing the defendant's brief, *Frye* v. *United States,* 293 F. 1013 (1923) at p. 1014.

[19] *Davis* v. *United States,* 165 U.S. 373 (1897). Loevinger notes that the *Davis* decision states that an expert cannot be impeached as to the "general teachings of science" and implies that this reflects an approach to expert testimony that was loathe to stray into inquiries concerning the general acceptance of proferred scientific opinion evidence; see Loevinger (1995) at p. 155, footnote 11. It should be noted,

jurisprudence prior to *Frye* was loathe to engage in any inquiry into the merits of the science underlying expert testimony of this sort.

The problem that presented itself within the *Frye* case was that of 'novel science.' The issue arose from the defendant's attempt to introduce expert testimony regarding the results of a systolic blood pressure deception test - an early form of the polygraph or "lie detector." The *Frye* Court acknowledged the case law permitting expert scientific opinion evidence, but rejected the expert testimony offered by the defence and, in doing so, articulated an exclusionary test for the admissibility of scientific opinion evidence:

> Just when a scientific principle or discovery crosses the line between the experimental and demonstrable stages is difficult to define. Somewhere in the twilight zone the evidential force of the principle must be recognized, and while courts will go a long way in admitting expert testimony deduced from a well-recognized scientific principle or discovery, *the thing from which the deduction is made must be sufficiently established to have gained general acceptance in the particular field in which it belongs.*[20]

This is the "Frye" or "general acceptance" test for the admissibility of expert scientific opinion evidence. Faced with the presentation of evidence concerning an unfamiliar and novel scientific technique the Court observed that there is a potential gulf between the positing of a scientific fact and what the Court termed the "demonstrable" stage of science. In making this distinction the Court is implicitly recognizing a concern over the reliability of the putative opinion evidence. The basis for demarcation that the Court chose to adopt was that of general acceptance of the science underlying the opinion within the relevant scientific community. In the case at hand the Court determined that the systolic blood pressure deception test had "not yet gained such standing and

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however, that the decision concerned the scope of examination at trial and not the admissibility of the proferred testimony. Even on the broader reading (the decision has been narrowly applied to medical testimony) suggested by Loevinger the decision is consistent with the *Frye* decision.

[20] *Frye* v. *United States,* 293 F. 1013 (1923) at 1014. My emphasis.

recognition among physiological and psychological authorities as would justify the courts in admitting [the testimony]."[21]

The general acceptance test emerged as the dominant standard for the admissibility of scientific opinion evidence in U.S. jurisdictions and remained so for the next seventy years. Loevinger notes that the case became one of the most frequently cited decisions in American evidentiary jurisprudence over this period.[22] The general acceptance rule that *Frye* set out continues, even in the wake of *Daubert* v. *Merrell Dow Pharmaceuticals Inc.,* to be the relevant standard of admissibility for this type of evidence in many state jurisdictions within the United States.[23] The standard clearly has its proponents notwithstanding mounting criticism since the 1950s. Let us then turn to consider how well the *Frye* test fares given the aforementioned success criteria.

The very fact that the *Frye* standard was the dominant exclusionary standard for expert scientific opinion evidence in most U.S. jurisdictions for seventy years, and continues to govern in many state jurisdictions, would seem to speak eloquently in favor of its efficiency as I have characterized efficiency. Under *Frye,* should a party to the proceeding challenge some proposed testimony, the Court would hear argument as to the general acceptance of the underlying science by the parties.[24] Should the trier of law find that the underlying science is not generally accepted in the relevant scientific community

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[21] *Ibid.*

[22] Loevinger (1995) at p. 157. Loevinger cites a search that generated 967 direct case citations since 1930 (provided by Bert Black of Weinberg and Green, Baltimore, Maryland). The progression of citations over the years is interesting. The numbers are suggestive of the increase in the use of scientific opinion evidence in the latter half of the twentieth century.

[23] See, for example, Meaney's 1995 study showing that *Frye* continues to govern in some twenty-two states with six of these reaffirming the *Frye* standard *after* the U.S. Supreme Court's judgment in *Daubert.* Meaney (1995) at pp. 191-199.

the evidence would be excluded from the jury's consideration. The expense and time consumption of such a standard is obviously greater than would be the case absent any exclusionary standard. Assuming, however, that the standard is principled the procedures involved here appear to place a burden on the process that is comparable to other evidentiary inquiries; one might think here of the process entered into in Canadian courts to determine if evidence found to be in breach of the Canadian *Charter of Rights and Freedoms* should be excluded under Section 24(2) of the *Charter*.[25]

What about the clarity and complexity of the general acceptance standard? Some scholars argue that the test is "unworkable."[26] Much of this criticism collapses, as I shall examine shortly, into concerns about whether the *Frye* standard is principled. On the surface, at least, the standard of general acceptance appears clear enough as is the form of evidence that a judge would have to consider to render a determination on the basis of the standard. This would consist of testimony from members of the relevant scientific community as to the acceptance, or lack of it, of the science underlying the putative opinion evidence. Some critics of the *Frye* standard argue that the standard is vague. The decision leaves it unclear as to which principle, "the specific tenet or the broader scientific principle," must be the subject of general acceptance.[27] Critics also cite

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[24] This would be in the form of a *voir dire,* perhaps with each side presenting written briefs or witnesses testifying as to general acceptance.

[25] Section 24(2) of the *Canadian Charter of Human Rights and Freedoms* provides for the exclusion of evidence obtained through the infringement of rights guaranteed under the *Charter* where the admission of the evidence would "bring the administration of justice into disrepute."

[26] Limpert (1996) at p. 71.

[27] Elliott (1989) at p. 495, Limpert (1996) at p. 72. Elliott gives the example of "accidentology": "That the laws of Newtonian physics are generally accepted does not mean that testimony by an 'accidentologist' who applies these laws to a particular accident should necessarily be admitted." One could substitute any of one's favorite spurious pseudo-scientific doctrines that appeal to recognized scientific principles in this example.

potential difficulty in identifying the relevant scientific community as a problem with the test.[28] Both of these concerns have some merit as principled objections but neither is fatal to the standard merely from the standpoint of efficiency. It remains open for Courts to further articulate the *Frye* standard by specifying, for example, that specific tenets must be generally accepted rather than merely broader background principles that are auxiliary to the science under consideration. The problem of identifying the relevant scientific community poses no serious problem on mere efficiency grounds either. "Surrogate" indicators, such as the presence of persons teaching and researching in the field in question at respected universities, and the existence of peer reviewed journals devoted to the field, have been proposed as reasonable and acceptable guides to the presence of the relevant community. Assuming that the standard accomplishes its epistemic aim it is difficult to make a compelling case that the standard is inefficient.

Before turning to consider whether *Frye* offers a principled exclusionary standard some mention should be made concerning a common complaint leveled against the standard. Some criticize the general acceptance rule arguing that it places judges in the position of ruling upon scientific validity. This is problematic, critics charge, as judges are ill-placed to make such determinations.[29] In *Daubert,* for example, the U.S. Supreme Court heard *amici* arguments from scientific organizations arguing that endorsement of any screening role for the judge will "sanction a stifling and repressive scientific orthodoxy and will be inimical to the search for truth."[30] The argument that judges are unprepared to rule upon scientific validity may have some merit. To apply this argument

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[28] *Ibid.*

[29] Elliott (1989), at p. 495.

to the *Frye* standard proceeds, however, from a fundamental misapprehension. As Elliott correctly notes in respect of the *Frye* standard, "the courts are not really attempting to determine for themselves whether particular scientific theories are correct; rather they are asking whether theories have achieved a minimum level of acceptance by the scientific community."[31] The *Frye* standard is non-epistemic and only speaks to whether the science in question is, in fact, accepted within the relevant community. Because this determination is parasitic on the community itself we should actually regard the standard as an exemplar of judicial deference to those who are ostensibly best placed to make determinations as to scientific validity: the members of the scientific community themselves.

While the general acceptance test provides an efficient exclusionary basis for scientific opinion evidence it fares far less well as a principled basis for exclusion. Recall that the criteria established for evaluating the principled qualities of an exclusionary test called for sufficient specificity to enable demarcation between injurious and non-injurious science, consistency of application, and breadth of application. Let us consider *Frye* utilizing each of these criteria. We may begin by observing that the general acceptance standard does allow for sufficient breadth of application. General acceptance is, *prima facie,* a non-epistemic standard; it does not invite us to ask why the science that underlies the opinion is reliable. In this the standard amounts to little more than a head count. Any field of human inquiry, from the natural sciences to the human sciences, to fields that are not usually considered scientific (literature studies, philosophy, theology, para-normal

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[30] *Daubert* v. *Merrell Dow Phamaceticals, Inc.*, 113 S.Ct. 2786 (1993), at p. 2798.
[31] Elliott (1989), at p. 495.

studies, etc.) could conceivably be one that attains general acceptance of various claims germane to that field. There is nothing logically, or metaphysically, that precludes such acceptance in any field of inquiry that we might imagine. We may therefore conclude that the standard is sufficiently broad to be applicable to any putative scientific opinion that a court might face. Of course, I am not suggesting that fields so obviously unscientific would actually find their way to court. The point is rather that if the standard is incapable, in principle, of distinguishing between such fields and that of reliable science, then we must question its adequacy with respect to unreliable scientific opinions.

Some scholars have criticized the *Frye* standard asserting that it is an invitation to inconsistency within the law. McCormick notes, for example, that the *Frye* standard has been applied "selectively" by courts; that only in polygraph cases has the standard been applied consistently and that Courts, "were much more willing to note judicially, or to look less closely at, the validity and reliability of other kinds of scientific evidence."[32] One might interject that this is not evidence of any difficulty with the *Frye* standard, but rather with particular instances of its application by judicial decision makers. Limpert, however, observes that the standard of general acceptance assumes that, "a scientific community both exists, has tested the principle in question, and has achieved consensus on the issue" and calls these assumptions into question.[33] He additionally raises the problem of a "bootstrap validation" whereby, "[a] small number of people accept each

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[32] McCormick (1982), at p. 884.

[33] Limpert (1996), at p. 72. Limpert observes that testing standards and approaches to error rates will vary across scientific disciplines. Some sciences such as psychology, often deployed in the courtroom, are based far more upon observation than empirical testing; see p. 78.

other's untrue claims in order to protect their professional reputations and careers."[34] In this last case the concern is that a sub-group of scientists may be able to rely upon each other to create for the Court an exaggerated impression of the acceptance of the science in question. While many of these points raise concerns for what I term the specificity of the exclusionary standard, there are also consistency-related concerns here as well. The first concern expressed, that the standard has been applied inconsistently, is empirical and of the least significance. While past Courts may, in fact, have been inconsistent in their applications of the *Frye* standard, the partisan of the standard may dismiss such evidence as representative of judicial error rather than an indication of the unprincipled nature of the standard.

The concerns expressed by Limpert regarding the identification of the scientific community, and assumptions of testing and consensus are much more damaging to the claim that the application of the *Frye* standard can, *in principle*, render consistent judgments. While it is possible to generate formulas for the constitution of general acceptance that judges could efficiently apply, it is much less clear that the application of such formulas would yield either consistent judgments or satisfactory distinctions between injurious and non-injurious scientific testimony. What Limpert is suggesting here is that the scientific community is far less homogenous than the standard of general acceptance must assume. If the scientific community in fact exhibits heterogeneity, at

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[34] *Ibid.* Limpert cites the case of *People* v. *Kelly,* 130 Cal. Rpt. 144 (S.C. 1976), as an illustration of this problem. In this case it was discovered that "a group of three voiceprint experts cited each other as proof of the general acceptance of their technique. When one testified, he would cite papers authored by the other two. Thus, the fictional nature of this technique of voice printing was hidden from a number of courts." This difficulty with the *Frye* standard is arguably carried over within the *Daubert* standard, which incorporates general acceptance within the field as one of several factors that a judge must consider in determining the admissibility of scientific opinion evidence.

least in some instances, then a standard that proceeds purely on the basis of a head count could well result in inconsistent decisions concerning comparable evidence. This can be illustrated from the problem, mentioned above, of a "bootstrap validation" whereby an unrepresentative collection of experts carve out a niche of acceptance within jurisprudence simply by appealing to each other as evidence of general acceptance. Given a more representative sampling of the relevant community it is possible to imagine a substantially different outcome in the reception of comparable opinion evidence. The difficulty essentially arises from the application of a non-epistemic standard by the trier of law that defers to the community in question. Stated more accurately, *the Court defers to such evidence of the scientific community as it has available.* The standard is therefore vulnerable to the 'garbage in, garbage out' maxim with results that could, in principle, yield inconsistent decisions that are not simply the result of judicial error.

The general acceptance test is also vulnerable to criticism on the basis that, in principle, it fails to provide a sufficient basis for achieving the epistemic goal of an exclusionary test. A sufficient test will ensure, so far as is practicable, that unreliable scientific testimony is excluded from consideration and reliable testimony is included. The *Frye* standard provides a surrogate measure of reliability; that is, it assumes that there will be a correlation between the general acceptance of a scientific theory or technique and its reliability. There is some philosophical support for the claim that general acceptance is a characteristic feature of science.[35] Kuhn, for example, characterizes "mature science" in terms of its possession of a paradigm. For Kuhn the

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[35] Kuhn (1970) at p. 22. Kuhn writes of the possession of a paradigm that, "Except with the advantage of hindsight, it is hard to find another criterion that so clearly proclaims a field of science."

concept of a paradigm is a meta-unit of analysis that stands above individual scientific theories. A paradigm is a "strong network of commitments - conceptual, theoretical, instrumental, and methodological" that a scientist shares with others within his given field.[36] More importantly, under the Kuhnian analysis of science, a paradigm-governed mature science is one characterized by the general acceptance of its commitments by its constituent members. To fail to adhere to these commitments in periods of paradigm-governed research - what Kuhn calls "normal science" - is to cease being a scientist.[37] It is tempting at this point to suggest that paradigms, and with them general acceptance, emerge because they seem better than their competitors where 'better' is understood in terms of more reliably accounting for the problems that the paradigm directs itself toward. We would do better to resist such a temptation.

While there is much merit to Kuhn's analysis in that it provides a general framework for understanding scientific change, there are problems in utilizing the account to support the *Frye* standard. First, our interest is in the reliability of particular scientific theories or techniques that underlie scientific testimony given in court. Kuhn's account of a paradigm is vague but he does indicate that a paradigm is a different unit of analysis than that of a theory. It is thus unclear whether general acceptance of a paradigm - if indeed this ever truly is the case - need entail the general acceptance of the constituent theories and techniques that are of concern in the courtroom.[38] If we actually take up an

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[36] *Ibid.*, at p. 42.

[37] *Ibid.*, at pp. 18-19.

[38] Laudan notes that Kuhn is unclear on the subject of whether paradigms "entail or inspire constituent theories." Laudan (1977) at p. 74. If it is the former one should expect that general acceptance is a feature of the constituent theories of a paradigm; an expectation that does not seem warranted given the history of science. Laudan also notes that the history of science discloses a far less clean-cut image than that

analysis of science we find that periods of "normal science" are often attended by competing theories that need not exhibit general acceptance. To require general acceptance of a theory or technique when an examination of science reveals that such is often not the case proves as heavy-handed as the critiques of the *Frye* standard charge. Testimony that is both probative and reliable could be excluded under such a standard, an undesirable result of an exclusionary test.

The most problematic aspect of the *Frye* standard comes back to the issue of reliability. The concern underlying the rationale for an exclusionary test is epistemic: we want to ensure that scientific testimony meets a satisfactory threshold of reliability. General acceptance is, at best, a surrogate for an epistemic standard. General acceptance would constitute a direct indicator of reliability only if there was a direct correlation between the general acceptance of a set of beliefs and reliability. As I argued above, it is conceivable that any field, however unreliable, could attain a standard of general acceptance within its ranks. Even if we remove clearly unscientific fields from consideration with a wink and a nod (and nothing about the *Frye* standard would seem to provide a basis for doing so), the plain fact is that even unproblematically scientific fields exhibit instances where the generally accepted theories within the field are either unreliable or lack substantial empirical confirmation ('corroboration' in Popper's terms). With respect to the former one could cite the notoriously successful, but spectacularly unreliable, ether theories of the nineteenth century or the widely accepted, yet unreliable, Ptolemaic astronomy of the sixteenth century. With respect to the latter, many well-

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suggested by Kuhn. At no point in this history, Laudan argues, have the sciences lacked co-existing paradigms, see Laudan (1977), at pp. 74 and 151.

respected contemporary theories that enjoy general acceptance, relativity theory, the 'big bang' theory in cosmological physics, and evolutionary theory in biology, exhibit scant empirical confirmation that would support the contention that they are reliable.[39] We cannot regard general acceptance as neither a necessary nor a sufficient condition for reliability and, given this, the *Frye* standard is insufficient as a principled test for screening injurious scientific testimony.

The U.S. Case Law: *Daubert* v. *Merrell Dow Pharmaceuticals, Inc.*

The *Frye* standard became, as alluded to above, the subject of considerable scholarly and legal debate within the U.S. in the last three decades of the twentieth century. This debate was exacerbated by the adoption of the U.S. Federal Rules of Evidence by Congress in 1975. With this act Congress in effect eradicated the common law of evidence in Federal Courts and replaced it with codified versions of the common law. The relevant rules respecting expert evidence are Rules 402 and 702. Rule 402 sets forth the baseline for the admission of evidence and did so in terms that accord with what I've characterized as the "inclusionary approach":

> Rule 402 - All relevant evidence is admissible, except as otherwise provided by the Constitution of the United States, by Act of Congress, by these rules, or by the rules prescribed by the Supreme Court pursuant to statutory authority. Evidence which is not relevant is not admissible.

Rule 702 spoke specifically to the admissibility of expert opinion evidence:

> Rule 702 - If scientific, technical, or other specialized knowledge will assist the trier of fact to understand the evidence or to determine a fact in issue, a witness qualified as an

[39] The same is true of numerous forensic techniques that are widely accepted and commonly deployed in the courtroom. See Jonakait (1994), at p. 2117.

> expert by knowledge, skill, experience, training, or education, may testify thereto in the form of an opinion or otherwise.[40]

In *United States* v. *Abel* the U.S. Supreme Court considered the role that the common law of evidence would continue to play in Federal Courts and ruled that where the Rules of Evidence appear to be consistent with previous common law precepts the common law may serve as an aid in the interpretation and application of the Federal Rules.[41] The question naturally arose as to what the status of the *Frye* standard was in light of Rule 702 - a rule that makes no mention of "general acceptance" as a pre-requisite to the admission of expert scientific testimony.

In *Daubert* v. *Merrell Dow Pharmaceuticals Inc.,* the U.S. Supreme Court faced the issue of whether the U.S. Federal Rules of Evidence had displaced the *Frye* standard in Federal Courts. The case arose from the petitioners' claim alleging birth defects sustained as a result of a mother's ingestion during pregnancy of Bendictin, an anti-nausea drug marketed by the respondent pharmaceutical manufacturer. The respondents argued that the drug does not cause birth defects in humans and provided experts testifying that no study has shown the drug to be such a risk factor. The petitioners sought to adduce the testimony of their own experts to challenge the claims of the opposing experts. The petitioner's experts sought to introduce animal studies purporting to show a correlation between the drug and birth defects, pharmacological studies showing similarities between the chemical structures of Bendictin and substances known to cause birth defects, and reanalysis of the earlier evidence. The respondents objected to the admissibility of the testimony of the petitioners' experts and the trial court rejected the

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[40] This is the pre-*Daubert* version of Rule 702. Following *Daubert*, the U.S. Federal Rules of evidence

testimony on the basis of the *Frye* standard. The Ninth Circuit Court of Appeals affirmed the judgment below, upholding the *Frye* standard. The U.S. Supreme Court, however, reversed the judgments below and held unequivocally that the *Frye* standard should not be applied in Federal trials.[42] The basis of the Court's judgment was that the statutory rules of evidence superceded the common law and, without any indication that general acceptance had been adopted in the rules, it could not be applied. The U.S. Supreme Court found no such indication in the Federal Rules.

Had the U.S. Supreme Court limited its ruling to the issue at bar *Daubert* would seem to endorse a very open-ended inclusionary approach to the admissibility of expert scientific opinion evidence. This is just the sort of the approach rejected in Chapter 3 on epistemic grounds. The Supreme Court, however, went on to emphasize the "gatekeeping" role of the trial judge, noting that, "under the Rules the trial judge must ensure that any and all scientific testimony or evidence admitted is not only relevant, but reliable."[43] The Court interpreted Rule 104 as entailing a "preliminary assessment" by the trial judge of the scientific validity of the "reasoning and methodology" underlying the opinion, as well as whether that reasoning and methodology could properly be applied to the facts of the case.[44] The U.S. Supreme Court speaks here, and in a number of other places in the *Daubert* decision, in terms of "scientific validity." The Court notes that there is a distinction to be made between validity and reliability and states that its concern is

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were amended to reflect the standard employed by the U.S. Supreme Court in *Daubert* (see below).

[41] *United States* v. *Abel,* 469 U.S. 45 (1984).

[42] *Daubert* at p. 2794.

[43] *Ibid.,* at p. 2795. In doing so the Court sought to strike a balance between an inclusionary approach to evidence and concerns over reliability and the problem of expert knowledge. As we shall see, many concur with Milich's assessment that, "the results are more schizophrenic than balanced." See Milich (1994), at p. 923.

with "evidentiary reliability" which, in a case involving scientific evidence, "will be based upon *scientific validity.*"[45] Should the evidence prove unreliable under this judicial analysis the Supreme Court noted that a trial judge could exclude the evidence under Rule 403, which permits exclusion where the probative value of the evidence is outweighed by its prejudicial effect.[46] By adopting this interpretation of the Federal Rules, the Court endorsed what I've characterized as the exclusionary approach to scientific opinion evidence. The Court, moreover, expanded the judge's role from that which we've seen in respect of *Frye.* As we've seen, the general acceptance test was a test that embodied deference to the scientific community. Under *Daubert* the trial judge does not, *prima facie,* defer to the scientific community; rather, the trier of law must render a determination of the 'scientific validity' of the reasoning or methodology underlying the opinion.[47]

In *Daubert* the U.S. Supreme Court adopted an exclusionary approach that places trial judges in the business of evaluating science. The Court did not, strictly speaking, rule upon *how* trial judges should go about this determination.[48] What the Court did elect to do was to offer *obiter dicta* concerning the factors that bear upon such a determination.[49] This *obiter dicta* constitutes the *Daubert* test for the admissibility of

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[44] *Daubert,* at p. 2796.
[45] *Ibid.,* at p. 2795, footnote 9.
[46] *Ibid.,* at p. 2798.
[47] This determination will, however, require the judge to make assessments as to the reliability of the science at issue based upon the submissions of counsel and the testimony of experts called by the parties should a *voir dire* be held on the issue of admissibility.
[48] *Ibid.,* at p. 2796.
[49] *Obiter dicta* are words of a judgment that are unnecessary for the decision reached in the case. That is, they reflect the court's opinion on collateral issues not at stake in the trial. *Obiter dicta* are not binding as precedent, but, where such statements issue from a high judicial level, such as the Supreme Court, they can be extremely persuasive for lower courts. In *Daubert,* the question of what standard to employ for the

expert scientific opinion evidence. The Court focused upon reliability as the basis for making a determination between injurious and non-injurious scientific testimony and linked reliability to a notion of scientific validity; i.e. reliable testimony of this sort should be scientifically 'valid' in the sense that the principle in question supports "what it purports to show."[50] In order to assist triers of law in making determinations of scientific validity the Court adopted something of the 'shopping list' approach of Mark McCormick.[51] The idea motivating the list being, of course, to identify factors that serve as good *indicia* of scientific validity (i.e. confirmation) and hence, of evidentiary reliability.

The U.S. Supreme Court suggested four factors that a trial judge should consider when evaluating whether some proffered opinion constitutes scientific knowledge. First, the Court stated that a "key question" is whether a theory or technique "can be (and has

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admissibility of scientific opinion evidence was not before the U.S. Supreme Court; rather, the issue at bar was whether the *Frye* standard was still applicable under the U.S. Federal Rules of Evidence.

[50] *Ibid.*, at p. 2795, footnote 9. It is important to note that the Court's use of the notion of 'scientific validity' is not to be equated with a technical philosophical understanding of scientific validity. Validity is a logical notion associated with deductive arguments/explanations. The concern of the law of evidence, however, is with scientific confirmation: how well-confirmed is some piece of scientific testimony? The Court's formulation of "scientific validity" as "the principle support[s] what it purports to show" is more akin, I submit, to a philosophical notion of scientific confirmation.

[51] *Ibid.*, at p. 2797. See, McCormick (1982), at pp. 911-912. McCormick suggests a list of the following factors:

> (1) the potential error rate in using the technique, (2) the existence and maintenance of standards governing its use, (3) presence of safeguards in the characteristics of the technique, (4) analogy to other scientific techniques whose results are admissible, (5) the extent to which the technique has been accepted by scientists in the field involved, (6) the nature and breadth of the inference adduced, (7) the clarity and simplicity with which the technique can be described and its results explained, (8) the extent to which the basic data are verifiable by the court and jury, (9) the availability of other experts to test and evaluate the technique, (10) the probative significance of the evidence in the circumstances of the case, and (11) the care with which the technique was employed in the case.

It should be apparent that a great many of these considerations have absolutely nothing to do with the question of scientific validity (confirmation). The U.S. Supreme Court evidently chose to focus on those factors that it deemed relevant to a determination of scientific validity.

been) tested."[52] The Court cited Popper's dictum that falsifiability is what distinguishes science from other fields of human inquiry, as well as Hempel's claim that scientific explanations must be capable of empirical test, in support of this requirement.[53] The second factor concerned "whether the theory or technique has been subjected to peer review and publication."[54] The Court rightly noted that peer review and publication does not necessarily correlate with reliability but observed that this feature, "is a component of 'good science,' in part because it increases the likelihood that substantive flaws in methodology will be detected."[55] The third factor addressed by the Court, without much comment, noted that where a "particular scientific technique" is at issue in the generation of an opinion, "the court ordinarily should consider the known or potential rate of error."[56] Should the error rate prove high, the Court is presumably saying that this would tend against the reliability of the opinion evidence. The final factor recommended was that of *Frye:* general acceptance within the scientific community. The Court noted that, "widespread acceptance can be an important factor in ruling particular evidence admissible, and 'a known technique that has been able to attract only minimal support within the community,' may properly be viewed with skepticism."[57] With this recommended shopping list of four factors, U.S. Federal trial judges were to conduct the preliminary inquiry to determine whether proposed scientific testimony should be excluded under their discretionary power embodied in Rule 403 of the Federal Rules of

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[52] *Ibid.*, at p. 2796.
[53] *Ibid.*, at pp. 2796-2797. See Popper (1989) at p. 37, and Hempel (1966) at p. 49.
[54] *Ibid.*, at p. 2797.
[55] *Ibid.*, the Court cited, Ziman, J., *Reliable Knowledge: An Exploration of the Grounds for Belief in Science* (Cambridge, Cambridge University Press, 1978); Relman and Angell, "How Good is Peer Review?" 321 *New England Journal of Medicine* (1989) 827.
[56] *Ibid.*

Evidence. To date the U.S. Supreme Court has not revisited the *Daubert* criteria, although subsequent decisions have conducted some 'mopping-up' operations on legal questions arising from the judgment.[58]

The *Daubert* decision did, however, subsequently prompt Congress, in 2000, to alter Rule 702 to reflect the factors identified by the U.S. Supreme Court. The new rule provides:

> Rule 702. Testimony by Experts
> If scientific, technical, or other specialized knowledge will assist the trier of fact to understand the evidence or to determine a fact in issue, a witness qualified as an expert by knowledge, skill, experience, training, or education, may testify thereto in the form of an opinion or otherwise, if (1) the testimony is based upon sufficient facts or data, (2) the testimony is the product of reliable principles and methods, and (3) the witness has applied the principles and methods reliably to the facts of the case.[59]

The new Rule 702 codifies the judicial gatekeeping role expressed in the *Daubert* decision by requiring that the expert opinion meet the three conditions stipulated. These conditions, requiring that the opinion be based upon sufficient data, that it be the product of reliable methods, and that its application to the facts at issue be reliable, echo the emphasis on reliability stated in *Daubert*. That is, the Rule requires that judges evaluate the reliability of putative expert testimony in discharging their gatekeeping role. The post-*Daubert* Rule 702 does not, however, add anything beyond *Daubert* so far as the

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[57] *Ibid.*

[58] In *General Electric Co.*, v. *Joiner,* 522 U.S. 136 (1997) the U.S. Supreme Court considered the standard of judicial review concerning trial judge determinations made under the *Daubert* criteria. The Court ruled that such discretionary determinations should not be overturned unless the reviewing court determines that there has been an abuse of discretion by the lower court (p. 147). More recently, in *Kumho Tire Co., Ltd.*, v. *Carmichael,* 119 S.Ct. 1167 (1999), the U.S. Supreme Court considered whether the *Daubert* criteria should extend to technical opinions such as those offered by engineers. The Court reiterated that the *Daubert* criteria are non-binding "suggestions" (p. 1175) and that it is within the discretion of the trial judge to determine whether they are appropriate to an evaluation of such expert technical opinions (p. 1176).

[59] U.S. Federal Rules of Evidence.

conditions or criteria that a judge must consider in making this evaluation. The four criteria of the *Daubert* standard therefore survive as guidelines for interpreting Rule 702.

How well does the *Daubert* test fare under the efficiency and principled standards of evaluation invoked at the outset of the chapter? In many respects *Daubert* stimulates more problems than the *Frye* general acceptance test. In terms of efficiency the standard appears comparable to that of *Frye* with respect to the time and pecuniary demands that it places upon the legal system. The salient efficiency factor arising from *Daubert* concerns the judicial interpretation of the test's criteria. The U.S. Supreme Court provided a shopping list of factors to guide trial judges - the requirement of empirical testing, peer review, known or potential error rates, and general acceptance - but the judgment provides no real guidance as to what these *indicia* of reliability actually mean, how trial judges are to apply them, or how trial judges are to weigh the various factors against one another. Some of the explanations invoked in articulating the criteria, Popper's falsifiability criterion is a good example, are philosophically technical and apt to be beyond the knowledge and expertise of many members of the judiciary. This concern figured prominently, as noted in Section 4.2 above, in Chief Justice Rehnquist's dissent.[60] Some proponents of the *Daubert* standard might respond that a set of open-ended criteria is an asset to trial judges; it allows for greater flexibility in dealing with diverse matters on a case by case basis. It is surely the case that flexibility is an asset. Indeed, the need for flexibility provides some of the motivation for the breadth of application requirement to a principled rule articulated in Section 4.2. A distinction, however, needs to be made here between flexibility and licensing an interpretative free-for-all. In order for there to be

flexibility one must understand the salient concerns, embodied within the criteria, about which one is to be flexible. A standard that requires judges to make determinations beyond their expertise ('scientific validity'), with virtually no guidance as to what the terms of the technical criteria denote, passes well beyond flexibility.

The preceding concern over the sparse guidance of the *Daubert* criteria leads us quite naturally into a related principled objection to the standard. Justice abhors inconsistency and the *Daubert* standard, owing to lack of guidance, raises a real specter of inconsistent decision-making. Goldman articulates this problem in his analysis of the *Daubert* decision by noting two post-*Daubert* breast implant cases, *Hopkins* v. *Dow Corning Corp.*[61] and *Hall* v. *Baxter Healthcare Corp.*,[62] in which the plaintiffs in each case sought to introduce expert opinion evidence alleging a causal link between silicone breast implants and mixed connective tissue disease. In the *Hopkins* case, the decision in favor of the plaintiff survived appeal and eventually came before the U.S. Supreme Court. The case was appealed by Dow Corning on the ground that the Appeals Court, deciding after *Daubert,* had erred in its determination of the applicable exclusionary standard. The U.S. Supreme Court, however, upheld the *Hopkins* decision. Despite this decision, the Federal District Court in Oregon in the *Hall* case, as well as subsequent Appeals Courts, have utilized the *Daubert* criteria to exclude similar scientific evidence as was allowed in *Hopkins* on the basis that no scientific studies had sufficiently made out the causal link in a manner that would satisfy the *Daubert* standard.[63] The difficulty in consistent

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[60] *Daubert* v. *Merrell Dow Pharmaceuticals, Inc.*, 113 S.Ct. 2786 (1993), at p. 2800.
[61] *Hopkins* v. *Dow Corning Corp.*, 33 F.3d 1116 (9th Cir. 1994).
[62] *Hall* v. *Baxter Healthcare Corp.*, 947 F.Supp. 1387 (D. Or. 1996).
[63] Goldman (1999), at p. 307.

application of the Daubert criteria on this issue, involving very similar evidence, underscore the problems in formulating a viable exclusionary rule and strongly suggests that the criteria are too imprecise to allow for principled decision-making.

4.4 Applications of the Exclusionary Approach: Canadian Case Law

The Canadian Case Law: pre-*Mohan*

This examination has thus far focused upon the U.S. jurisprudence embodied by *Frye* and *Daubert.* I now wish to examine the Canadian treatment of expert scientific opinion evidence. Current Canadian law also attempts to strike a balance between the liberal inclusion of such evidence and an exclusionary approach that purports to allow for the exclusion of injurious scientific testimony. We shall see, however, that the Canadian jurisprudence often closely patterns the U.S. approaches already canvassed and is consequently heir to many of the same flaws discussed in respect of the American standards.

Prior to *R.* v. *Mohan,* expert scientific testimony was admissible in Canadian courts subject to the relevance of the testimony to a fact at issue and to the "helpfulness" of the opinion to the trier of fact. The "helpfulness" criterion in this instance denoted that the testimony must provide the Court with insight into the facts at issue that, absent the requisite expertise, a layperson would be unable to formulate. In *R.* v. *Abbey* the Supreme Court of Canada cited the English Appeals Court in support of this standard:

> With respect to matters calling for special knowledge, an expert in the field may draw inferences and state his opinion. An expert's function is precisely this: to provide the judge and jury with a ready-made inference which the judge and jury, due to the technical nature of the facts, are unable to formulate. "An expert's opinion is admissible to furnish the Court with scientific information which is likely to be outside the experience and knowledge of a judge or jury. If on the proven facts a judge or jury can

> form their own conclusions without help, then the opinion of the expert is unnecessary." *R.* v. *Turner* (1974), 60 Cr. App. R. 80 at p. 83, *per* Lawton, L.J.[64]

The reader will readily note that this is not an exclusionary approach. There are no conditions to inclusion that attempt to screen out injurious scientific testimony. Indeed, the very issue posed by epistemic dependence and shaky or unreliable scientific testimony does not attract the Court's attention. This issue has, nonetheless, come before Canadian courts. Prior to the Supreme Court's decision in *R.* v. *Mohan* we find a number of differing approaches endorsed by lower courts.

In *R.* v. *Medvedew*, the Manitoba Court of Appeal considered the admissibility of scientific testimony concerning voiceprint identification. The Court explicitly chose to adopt the *Frye* standard, stating of the general acceptance test that, "it makes sound sense and expresses a view in accord with the principles of the common law."[65] The Court went on to reject the testimony concerning the voiceprint identification finding that the state of the technique was not generally accepted and as such represented evidence that the trier of fact could not rely upon.[66] We have already seen, however, that the *Frye* standard provides an unprincipled response to the epistemic needs of the law.

While the *Manitoba Court of Appeal* favorably received *Frye* in 1978, the test has not been so well received in subsequent decisions. Justice Kurisko rejected the test in the 1986 District Court of Ontario's decision in *R.* v. *Doe.*[67] This was given further weight in Justice Wilson's dissenting judgment (Lamer, C.J., concurring) in *R.* v. *Beland* in 1987.[68]

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[64] *R.* v. *Abbey* (1982), 68 C.C.C. (2d) 394 (S.C.C.) at p. 409. This particular formulation has a long history in English jurisprudence. It goes back (at least) to *Folkes* v. *Chadd*, 3 Doug. 157 (1782).
[65] *R.* v. *Medvedew* (1978), 43 C.C.C. (2d) 434 (Man.C.A.) at p.447.
[66] *Ibid.* at pp. 448-451.
[67] *R.* v. *Doe* (1986), 31 C.C.C. (3d) 353 (Ont. Dist. Ct), at p. 368.
[68] *R.* v. *Beland* (1987), 36 C.C.C. (3d) 481 (S.C.C.), at p. 506.

In *Beland* the learned justice noted the erosion of the general acceptance test within U.S. courts and favorably cited Mark McCormick's more inclusionary approach to this form of evidence.[69] Justice Langdon, of the Ontario Court General Division, in *R.* v. *Johnston*, subsequently took Justice Wilson's comments in the *Beland* dissent to be "persuasive authority for the proposition that the *Frye* test should not be adopted in Canada."[70] In 1993 the British Columbia Court of Appeal also rejected the *Frye* standard, again citing the U.S. literature criticizing the test for its rigidity.[71] Let's briefly examine these decisions.

In *R.* v. *Doe* Justice Kurisko rejected the *Frye* standard and instead endorsed the 'relevancy and helpfulness' approach of *Abbey*. The Court noted that, without more, *Abbey* does not establish an exclusionary test:

> All experts are called to testify about some significant issue in action; by definition their testimony is relevant. The question is not the relevancy of their testimony but its validity or reliability.[72]

Kurisko, J., went beyond *Abbey* by importing into the 'helpfulness' standard an analysis of whether the evidence could be prejudicial to the trier of fact or the court process. The considerations noted by the Justice were:

> (a) The danger that the jury could be misled by unreliable scientific testimony;
> (b) The danger that the jury would be confused by the issues raised by the putative testimony;
> (c) Undue delay arising from the process;
> (d) Needless presentation of cumulative evidence arising from the assimilation of expert knowledge into general knowledge;
> (e) The danger of a tendency of some evidence to "suggest a decision on an improper basis."[73]

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[69] *Ibid.*
[70] *R.* v. *Johnston* (1992), 69 C.C.C. (3d) 395 (Ont. Ct. Gen. Div.), at p. 413.
[71] *R.* v. *Dieffenbaugh* (1993), 80 C.C.C. (3d) 97 (B.C.C.A.) at pp. 105-106.
[72] Limpert (1996), at p. 81.
[73] *R.* v. *Doe* (1986), 31 C.C.C. (3d) 353 (Ont. Dist. Ct), at pp. 425-430. I have paraphrased the Justice here.

This analysis would seem to require some inquiry into the reliability of the putative testimony. In this case the learned Justice had the benefit of an independent court-appointed expert as well as the testimony of the partisans' experts as to the reliability of the polygraph evidence that was at issue. In deciding to admit the testimony Justice Kurisko appears to rely upon the testimony of the scientists that the technique was sufficiently reliable.[74] The Justice, however, provides no insight as to how a trier of law should assess the competing claims of the experts. This decision, much like the general acceptance test, represents a deferential approach to the scientists themselves. Unlike *Frye,* however, this decision provides no standard for assessing which expert to defer to. The decision therefore suffers from the unprincipled deficiencies of *Frye* coupled with a lack of efficiency in that it fails to provide sufficient guidance for the trier of law.

Justice Wilson's dissent in *Beland* receives *Frye* unfavorably and instead lends support to a standard of 'relevancy and helpfulness.' As noted, however, the dissenting judgment provides no guidance as to when scientific testimony should be excluded and is thus not an exclusionary approach to this issue. Justice Wilson's judgment, moreover, is a dissent and hardly settles the issue as authoritatively as indicated in Justice Langdon's decision in *R.* v. *Johnston.*

The decision in *R.* v. *Johnston* concerned the issue of whether the admissibility of DNA profiling evidence should be subject to a *voir dire.* The learned Justice took Justice Wilson's dissent in *Beland* to be determinative that the *Frye* standard should not be adopted in Canadian courts and interpreted the 'relevance and helpfulness' standard to indicate that, provided the evidence meets these initial standards, "further objections are

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[74] *Ibid.* at pp. 426-427.

relevant to weight and not to admissibility."[75] This is, once again, the inclusionary approach to scientific opinion evidence. Justice Langdon, much as with Justice Kurisko in *Doe,* was aware of and sought to address the concern over the reliability of this form of evidence. The Justice elected to do so by importing into the 'helpfulness' standard a test for the reliability of the putative testimony.[76] The learned Justice adopted a shopping list approach of factors for the trial judge to consider:

> Therefore, to assess whether novel scientific evidence is helpful, one should consider the following factors:
> (a) The potential rate of error.
> (b) The existence and maintenance of standards.
> (c) The care with which the scientific evidence has been employed and whether it is susceptible to abuse.
> (d) Whether there are analogous relationships with other types of scientific techniques that are routinely admitted into evidence.
> (e) The presence of failsafe characteristics.
> (f) The expert's qualifications and stature.
> (g) The existence of specialized literature.
> (h) The novelty of the technique in its relationship to more established areas of scientific analysis.
> (i) Whether the technique has been generally accepted by experts in the field.
> (j) The nature and breadth of the inference adduced.
> (k) The clarity with which the technique may be explained.
> (l) The extent to which the basic data may be verified by the judge and jury.
> (m) The availability of other experts to evaluate the technique.
> (n) The probative significance of the evidence.[77]

Justice Langdon's reliability test is comparable to the list of factors suggested by Mark McCormick - a list that influenced the formulation of the U.S. Supreme Court's *obiter dicta* in *Daubert.* This approach not surprisingly inherits problems that are similar to those that I've discussed in respect of *Daubert.* There is no guidance as to what the factors mean, how a trier of law is to evaluate them, or how the trier of law is to weigh the varying factors against one another. What, for instance, is a trier of law to make of

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[75] *R.* v. *Johnston* (1992), 69 C.C.C. (3d) 395 (Ont. Ct. Gen. Div.), at p. 413.
[76] *Ibid.,* at p. 414.
[77] *Ibid.,* at p. 415.

item (6), the nature and breadth of the inference adduced? Which sorts of inferences are problematic? Are broad inferences necessarily problematic? Several of the factors chosen are also surrogate measures of reliability that have no necessary connection to epistemic reliability.[78] For example, while a specialized literature is characteristic of scientific knowledge it is by no means unique to scientific knowledge. Such a literature is also characteristic of unscientific academic fields (literature and fine arts) and one can easily imagine such a literature for pseudo-scientific fields (astrology, palmistry, tarot, etc.). The *Johnston* test consequently fails, as with the *Daubert* test, to provide either a principled or efficient exclusionary approach.

Another 1992 decision of the Ontario Court General Division, this time Justice Moldaver in *R.* v. *Melaragni,* revisited the issue of the reliability of scientific testimony. Justice Moldaver explicitly went beyond the relevance and helpfulness standard stating,

> Merely because the proposed evidence passes some minimum threshold test of reliability does not in and of itself lead to its automatic inclusion. When the Crown seeks to tender evidence which involves a new scientific technique or body of scientific knowledge, it must, of course, establish that the evidence is relevant and that it passes a minimum threshold test of reliability.[79]

This is a much more explicit statement of the exclusionary approach than we find in either *Doe* or *Johnston.* Unfortunately the test proposed by Justice Moldaver represents another shopping list of factors with no guidance as to the meaning of the factors, their assessment, or how they are to be balanced.[80] In many respects the test suggested is even

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[78] Limpert (1996) at p. 82.

[79] *R.* v. *Melaragni* (1992) 73 C.C.C. (3d) 348 (Ont. Ct. Gen. Div.), at pp. 352-353.

[80] *Ibid.,* at p. 353. Some of the factors suggested by Justice Moldaver are similar to those suggested by Justice Langdon. Most, however, seem to concern the ability of the opposing party to challenge the evidence in court. This is suggestive of the inclusionary approach and, in any case, a non-epistemic consideration. Here are the factors set out by Justice Moldaver (at p.353):

> (1) Is the evidence likely to assist the jury in its fact-finding mission, or is it likely to confuse and confound the jury?

less adequate than what we find in *Johnston,* with the only clear epistemic consideration being the reliability of the proposed scientific technique or knowledge. It is most unhelpful to suggest that scientific testimony is admissible if it is reliable and, as the test for this reliability, invoke a criterion that the testimony must be reliable. That is precisely what is at issue! The *Melaragni* test rather spectacularly fails to provide either a principled or efficient exclusionary response.

In the 1993 judgment in *R.* v. *Dieffenbaugh,* the British Columbia Court of Appeal considered the admissibility of a forensic scientist's testimony concerning a phenomenon characterized as the "anal gaping response." The Court noted the 'relevancy and helpfulness standard' set out in *Abbey* and observed that under this standard the testimony of the forensic specialist would be admissible.[81] The Court went on, however, to observe that this standard, "is not enough to ensure admissibility. This is because the law has long recognized that there will often be cases where relevant evidence will not be admissible in a criminal prosecution where its probative value is outweighed by its

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(2) Is the jury likely to be overwhelmed by the "mystic infallibility" of the evidence, or will the jury be able to keep an open mind and objectively assess the worth of the evidence?
(3) Will the evidence, if accepted, conclusively prove an essential element of the crime which the defence is contesting, or is it simply a piece of evidence to be incorporated into a larger puzzle?
(4) What degree of reliability has the proposed scientific technique or body of knowledge achieved?
(5) Are there a sufficient number of experts available so that the defence can retain its own expert if desired?
(6) Is the scientific technique or body of knowledge such that it can be independently tested by the defence?
(7) Has the scientific technique destroyed the evidence upon which the conclusions have been based, or has the evidence been preserved for defence analysis if requested?
(8) Are there clear policy grounds which would render the evidence inadmissible despite its probative value?
(9) Will the evidence cause undue delay or result in needless presentation of cumulative evidence[?]

[81] *R.* v. *Dieffenbaugh* (1993), 80 C.C.C. (3d) 97 (B.C.C.A.), at p. 108.

prejudicial effect."[82] The Court was impressed by the fact that the expert in question had admitted that there had been no controlled study of this phenomenon and that such experimentation, "is of central importance in determining the level of confidence which one can assign to scientific opinions."[83] Given "the present state of medical knowledge on the question of anal gaping" the Court expressed doubt that anyone could render reliable testimony on the matter.[84] The Court consequently ruled that the evidence should have been excluded under the trial judge's discretionary power to exclude evidence where the prejudicial effect outweighs the probative value of the evidence.

In rejecting the sufficiency of *Abbey* and invoking the power to exclude where prejudicial effect outweighs probative value the Court was clearly endorsing an exclusionary approach to scientific testimony. What standard, however, did the Court utilize to render its decision regarding the prejudicial effect and probative value issue? The Court explicitly rejected the *Frye* standard as too rigid and briefly canvassed a number of tests then extant in literature and case law.[85] The only indication that the Court gave as to the standard it would recommend was the pithy statement that it preferred a standard of "trustworthiness" to that of "helpfulness."[86] How was this trustworthiness determined in the case at hand? The Court made its determination by observing a lack of consensus between the few experts that had given attention to the phenomenon and noting the statements of the experts themselves concerning the lack of controlled

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[82] *Ibid.*
[83] *Ibid.*, at p. 104.
[84] *Ibid.*, at p. 105.
[85] *Ibid.*, at p. 106.
[86] *Ibid.*

studies.[87] The concern over "the present state of medical knowledge" and the lack of consensus among the experts suggests that general acceptance, notwithstanding the Court's rejection of *Frye,* was a compelling consideration. We have already seen that the general acceptance standard fails as a principled exclusionary approach. The concern over controlled experimentation is helpful but, as with other approaches canvassed here, we find no guidance as to how to assess such a practice in order to render a determination of trustworthiness. As the case stands, it cannot sustain either a principled or efficient exclusionary standard for scientific testimony.

The Canadian Case Law: *R.* v. *Mohan* and *R.* v. *J.-L.J.*

The Supreme Court of Canada finally addressed the questions posed by expert scientific opinion evidence in the 1994 decision in *R.* v. *Mohan.* The case concerned the admissibility of evidence of a defence expert psychiatrist who would testify that the perpetrator of the offence would be part of a limited and unusual class of persons that the accused did not match.[88] Justice Sopinka set out the following criteria for the admission of expert opinion evidence:

> (a) relevance;
> (b) necessity in assisting the trier of fact;
> (c) the absence of any exclusionary rule;
> (d) a properly qualified expert.[89]

Items (a), (b) and (d) are straightforward and consistent with the inclusionary approach that was articulated in *Abbey.* "Necessity to assist the trier of fact" in this instance restates

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[87] *Ibid.*, at p. 104.
[88] The case also engaged issues concerning the character evidence rules - issues that can be left aside for our purpose here.
[89] *R.* v. *Mohan* (1994), 89 C.C.C. (3d) 402 (S.C.C.), at p. 411.

the 'helpfulness' criterion of *Abbey,* that, "the evidence must be necessary to enable the trier of fact to appreciate matters in issue due to their technical nature."[90] The Court, however, noted that the mere 'helpfulness' standard of *Abbey* set too low a standard for admissibility and endorsed the rationale for an exclusionary approach. In discussing the relevance criterion the Court observed that the relevance of the expert opinion is not an end to the matter:

> Other considerations enter into the decision as to admissibility. This further inquiry may be described as a cost benefit analysis, that is "whether its value is worth what it costs": see *McCormick on Evidence,* 3rd ed. (1984), at p. 544. Cost in this context is not used in its traditional economic sense but rather in terms of its impact on the trial process. Evidence that is otherwise logically relevant may be excluded on this basis, if its probative value is overborne by its prejudicial effect, if it involves an inordinate amount of time which is not commensurate with its value or if it is misleading in the sense that its effect on the trier of fact, particularly a jury, is out of proportion to its reliability. While frequently considered an aspect of legal relevance, the exclusion of logically relevant evidence on these grounds is more properly regarded as a general exclusionary rule.[91]

The Court noted the concern posed by scientific testimony and epistemic dependence; namely that a trier of fact may accord unreliable scientific testimony more weight than it deserves because of the "mystique" of scientific authority and their inability to adequately understand the evidence.[92] The Court concluded that,

> [E]xpert evidence which advances a novel scientific theory or technique is subjected to special scrutiny to determine whether it meets a basic threshold of reliability and whether it is essential in the sense that the trier of fact will be unable to come to a satisfactory conclusion without the assistance of the expert.[93]

The decision clarified the approach that Canadian law would take. It clearly expressed an exclusionary rationale for dealing with scientific testimony and it locates this power to exclude within the trial judge's discretionary power to exclude evidence where the prejudicial effect of the testimony exceeds its probative value. The decision also locates

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[90] *Ibid.,* at p. 413.
[91] *Ibid.*
[92] *Ibid.,* at pp. 411-412.

the decision to exclude within a determination by the trial judge of the "reliability" of the putative expert opinion.

While *Mohan* clarified the approach of our law it nevertheless suffers from some severe deficiencies. Limpert notes that the Court restricts this reliability assessment to only novel scientific theories or techniques.[94] Issues concerning the reliability of science and the problem of epistemic dependence arise, however, in all applications of science in the courtroom and not simply in those involving novel science or novel applications of existing science. There may be, for example, good reasons to exclude scientific testimony where the particular application of otherwise reliable science discloses irregularities in the methodology utilized. If Limpert's interpretation of the decision is correct there is immediately a problem in the principled character of the decision in that generally accepted science may also disclose unreliable characteristics in particular instances that would not attract the trial judge's gate-keeping function. Beyond this problem, the decision, as with many of the lower court judgments reviewed, fails to provide any indication as to what "threshold of reliability" putative scientific testimony should meet, or how the trial judge should go about the actual task of evaluating scientific reliability.

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[93] *Ibid.*, at p. 415.

[94] Limpert (1996), at p. 82. This criticism may be overstated. While the Court's comments at the end clearly state that this is a determination that must be made in respect of novel science, they do not exclude such an examination in respect of scientific testimony generally. The discretionary power that the Court locates the basis for exclusion within is, moreover, a general exclusionary power and the Court's earlier comments concerning the "mystique" of scientific authority and the danger posed by unreliable science suggests that the scope of the trial judge's gate-keeping role is wider than the Court's puzzling later comments in respect of novel science. In *J.-L.J.* the Supreme Court of Canada noted that novel science, or novel applications of existing science, demands "special scrutiny" which indicates a heightened gate-keeping role in the case of novel science, see *R.* v. *J.-L.J.* [2000] 2 S.C.R.600 at pp. 616-617, but also clearly states that exclusion would be under the trial judge's general discretionary power to exclude evidence where the prejudicial effect outweighs the probative value of the evidence (p. 630), which would seem to open leave it open to Courts to exclude *any* scientific testimony that exhibits high prejudicial effect relative to probative value.

This lack of clear guidance, not surprisingly, was a recipe for lower courts to fill in the gaps in differing ways - a clear invitation to unprincipled results. Limpert notes two cases following *Mohan, R.* v. *JET* and *Petro Canada* v. *Canada-Newfoundland Offshore Petroleum Board,* in which the respective courts employed scattered and differing sets of factors to attempt the assessment indicated in *Mohan.*[95] He observes that, as I argue in respect of *Dieffenbaugh,* the *Frye* general acceptance standard often proves decisive in practice notwithstanding its explicit rejection.[96] The *Mohan* decision clearly stood in need of further interpretation from the Supreme Court.

The necessary further elaboration of the *Mohan* standard did eventually emerge from the Supreme Court of Canada in its more recent decision in *R.* v. *J.-L.J.*. The defence in the case sought to admit the testimony of a psychiatrist to establish that the crimes involved in the case fit a pattern of deviant sexual behavior that the accused allegedly lacked, based on the findings of a test involving a technique known as penile plethysmography. Justice Binnie noted that the *Mohan* decision, "kept the door open to novel science, rejecting the 'general acceptance' test formulated in the United States in *Frye* v. *United States*" and observed that the *Mohan* decision moved "in parallel" with the reliability based approach laid down in the U.S. Supreme Court's *Daubert* decision.[97] While the Court acknowledged differences in procedure between our law of evidence and the U.S. Federal Rules of Evidence, it nevertheless endorsed the *Daubert* test as providing, "a number of factors that could be helpful in evaluating the soundness of

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[95] *R.* v. *J.E.T.*, [1994] O.J. No. 3067 QL (Gen. Div.); *Petro-Canada* v. *Canada-Newfoundland Offshore Petroleum Board,* [1995] N.J. No. 258 QL (S.C.T.D.).
[96] Limpert (1996), at p. 83.
[97] *R.* v. *J.-L.J.* [2000] 2 S.C.R. 600, at p. 615.

science."[98] The basis for exclusion under this decision therefore remains the trial judge's general discretionary power to exclude evidence where the judge determines that the prejudicial effect of the evidence outweighs its probative value. In the case of scientific testimony the determination of prejudicial effect resides in the reliability of the science. What *J.-L.J.* adds to *Mohan* is the *Daubert* criteria as the basis for this reliability assessment by the trier of law.

The Supreme Court of Canada utilized the *Daubert* criteria in conjunction with *Mohan* to reach its decision with respect to the penile plethysmography evidence that was at issue in *J.-L.J.*. The Court noted that while the technique has had some application in therapeutic settings its application as a forensic tool was novel and hence attracted the "special scrutiny" demanded in *Mohan*.[99] The Court began the *Daubert* analysis by noting that, "The reliability of the scientific foundations of a theory that certain acts will almost always be done by people having certain distinctive characteristics requires evidence; it cannot simply be assumed."[100] That is to say that the science in question must be capable of testing and must have undergone such testing. In this case the Court found that the evidence of "standard profile" of such perpetrators was vague and, more importantly, that there was no evidence that the complementary tests utilized together with the penile plethysmography were applicable to the purpose intended.[101] Nor was there evidence from the expert or those that actually conducted the tests regarding the existence of test

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[98] *Ibid.*
[99] *Ibid.*, at pp. 616-617 ; *R.* v. *Mohan* (1994), 89 C.C.C. (3d) 402 (S.C.C.), at p. 415.
[100] *J.-L.J.* [2000] 2 S.C.R. 600, at p. 623.
[101] *Ibid.*, at pp. 623 and 625.

protocols or whether those protocols, if any, had been followed.[102] These last considerations figure in the first and third *Daubert* criteria, regarding the necessity of empirical testing, and requiring (among other things) the maintenance of appropriate standards. The third *Daubert* criterion, concerning the known or potential rate of error, was particularly important in this case. The Court was unimpressed by the expert's admission that the technique involved, "would detect a sexual deviant 47.5 percent of the time," a result that the Court characterized as, "so prone to error as not to be useful for purposes of identification or exclusion."[103] Nor was any evidence provided to support the expert's contention that the technique could be modified to decrease the number of false negatives, or of the science supporting the expert's claims regarding the significance of deviation from the purported norms picked out by the test.[104] The Court was also unimpressed by the evidence of the technique's level of acceptance:

> It seems to me that the trial judge was simply being offered a conclusory opinion that on cross-examination turned out to be short on *demonstrated* scientific support. In terms of the questions posed in *Daubert, supra,* Dr. Beltrami did address "the known or potential rate of error" but was not asked to address the history or acceptance of the techniques for diagnostic as opposed to therapeutic purposes, and the level of acceptance for that purpose among his scientific peers.[105]

Finding that the evidence was lacking in terms of satisfying the *Daubert* criteria, the Supreme Court held that the proposed testimony would rightfully be subject to exclusion under the trial judge's discretionary power to exclude evidence where the prejudicial effect of the evidence outweighs its probative value.

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[102] *Ibid.*, at p. 625.
[103] *Ibid.*
[104] *Ibid.*, at p. 626.
[105] *Ibid.*, at pp. 629-630.

The *Mohan* decision, supplemented by *J.-L.J.*, represents the current law in Canada on the issue of scientific testimony. The employment of criteria along the lines of the *Daubert* standard has been warmly received within the Canadian legal community.[106] Do the criteria established by these cases suffice, however, in terms of the evaluative criteria set out in Section 4.2? In one sense, at least, the law embodied in *Mohan* and *J.-L.J.* is more efficient than what we found in the *Daubert* decision. For U.S. Federal Courts the *Daubert* criteria are *obiter dicta* and represent suggestions by the U.S. Supreme Court (albeit very persuasive suggestions given the Court) as to how Federal trial judges should go about the task of assessing the reliability of scientific testimony. The Supreme Court of Canada's decision to employ the *Daubert* criteria is, by contrast, part of the *ratio decidendi* of the case and as such more clearly articulates the applicable law in this country.

The fact that the Canadian cases are more decisive in their endorsement of the exclusionary criteria is, however, small comfort for, as I argued earlier, the *Daubert* criteria fail to provide either a principled or efficient exclusionary rule. Consider the *Daubert* criteria more closely in light of the *J.-L.J.* facts. The Court questioned the adequacy of the testing involved in the formulation of the expert's opinion. There is no guidance, however, as to what sort of testing provides the foundation for reliable science or what sorts of problems admit of reliable empirical inquiry. The Court was persuaded in its determination of the prejudicial effect of the testimony by the high false negative rate of the technique. What, however, would constitute an acceptable error rate? Nor do the

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[106] See, for example, Lee, C., and Koller, R., "Will *Daubert* become the standard for expert evidence?" *The Lawyers Weekly* (January 18, 2002), p. 12; and Abdel-Aziz, A., "Excluding 'junk science' from

Daubert criteria provide any guidance as to how a trial judge should weigh the factors involved. The problem that this poses is more readily apparent if one considers *J.-L.J.* counterfactually. Suppose, for example, that the expert had provided the data of "tailored" scenarios that he alleged reduces the probability of false negative results with the technique. Would the lack of general acceptance and the dearth of empirical support still have been decisive against the admission of the evidence? What if the procedure was well-accepted as a forensic technique, well-confirmed through empirical testing, yet still disclosed a high rate of false negatives? Would this suffice for admission? With the scant guidance offered by the Court one does not know how to answer these questions and, echoing Rehnquist's dissent in *Daubert,* it is probable that most trial judges won't be in any better position to answer them. Legal disputes require resolution with the law at hand and trial judges will therefore fill in the gaps left by the Supreme Court. As was the case prior to *Mohan* and *J.-L.J.* they will do so in ways that often differ. The inefficiency of the decision in failing to provide adequate guidance is thus also a source of unprincipled decision-making. Comparable testimony may receive different receptions by trial judges who, because of the vagueness and lack of guidance in the criteria, interpret or weight the criteria differently. The Canadian law represented in *Mohan* and *J.-L.J.* consequently fails to satisfy the requirements for an adequate exclusionary approach.

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environmental cases" *The Lawyers Weekly* (January 18, 2002), p. 14.

Chapter 5 - The Exclusionary Approach: Scholarly Proposals

The issue of how to formulate an appropriate exclusionary test for the admission of scientific testimony in the courtroom has received scant attention from philosophers and voluminous attention from legal scholars and jurists. In this Chapter I will briefly consider two proposals. The first is that of a philosopher, Anthony Kenny, who attempts to set out the necessary conditions of a science that he argues are jointly sufficient to serve as a legal test for admissibility. This approach is an early form of the checklist approaches that we find in legal proposals - such as that of Mark McCormick - and many of the cases canvassed in Chapter 4. The second proposal is that of a legal scholar, Brad Limpert, and it attempts to formulate a practicable test for reliability that proceeds from assessments of uncertainty. I shall scrutinize both approaches utilizing the assessment criteria articulated in Chapter 4. Finally, I shall consider a philosophical argument that casts doubt on the project of demarcating science from non-science.

5.1 Kenny's Demarcation Approach

Anthony Kenny is, as far as I am aware, the first philosopher to directly assess the question of how to define science for the purpose of courtroom testimony. Kenny's approach, one that he admits is philosophically daunting, is to specify conditions that are necessary for a discipline to be scientific. He identifies four criteria that a trier of law should consider in this assessment:

- The discipline must be consistent.
- The discipline must be methodical.
- The discipline must be cumulative.

- The discipline must be predictive and therefore falsifiable.[1]

The first of Kenny's criteria does not refer to logical consistency. By "consistency" he means that the members of the discipline "must not regularly give conflicting answers to questions which are central to their discipline."[2] One might view this as comparable to Kuhn's claim that practitioners of a science will, during periods of "normal science," share the same paradigm. In terms of the criteria that we considered in the previous section this amounts to a requirement of general acceptance regarding the phenomena and processes that are central to the field at issue. Kenny acknowledges that in any science there will be disagreements in difficult or borderline cases but disagreements over "paradigm" instances of a phenomenon "falling under the explanatory principles of the discipline" is, according to Kenny, unscientific.[3]

Kenny's second criterion demands methodological agreement among the practitioners of the discipline. The constituent members, "will be in agreement about the appropriate procedures for gathering information within the discipline."[4] In particular, Kenny asserts that for a discipline to be scientific these methods must be capable of duplication by other members of the field and, where results are not replicated, there must be agreement "as to what kind of explanation of the failure is appropriate."[5] Kenny's third criterion is that the discipline must be cumulative. By this he means that practitioners within the field must be able to rely upon the work of others within the field. In Kuhnian terms one would say that a scientist accepts a paradigm and thus has no need "to build his

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[1] Kenny (1985), at pp. 49-50.
[2] *Ibid.*, at p. 49.
[3] *Ibid.* The disagreements Kenny notes here could be characterized in terms of what Kuhn calls the articulation of a paradigm, see Kuhn (1970), at pp. 23-34.
[4] Kenny (1985), at p. 50.

field anew, starting from first principles and justifying the use of each concept introduced."[6] This criterion thus reflects the epistemic dependence that characterizes science - discussed in Chapter 2 above - and the notion that the advancement of scientific knowledge is *via* cumulative growth. The last criterion that Kenny employs is that of predictiveness and falsifiability. By "predictive" Kenny means that the discipline must be capable of rendering predictions of "the not yet known from the already known."[7] Unscientific disciplines, Kenny uses literary criticism as an exemplar, are not generally predictive since there is no way of falsifying the claims made within the discipline. Kenny is careful to note that predictiveness and falsifiability do not constitute a sufficient condition for a field to be scientific.[8] Astrology, for example, provides a systematic method of predicting the future and we can, presumably, falsify the predictions of such a field by seeing if they fail to come to pass.

The test that Kenny proposes for demarcating science from non-science would supply a reasonably efficient legal test. Armed with these criteria, one could imagine a trier of law presented with submissions and *voir dire* testimony regarding some proposed opinion evidence that would speak to whether the proposed testimony fulfills these criteria. The pecuniary costs and time required for such an inquiry would not be much more substantial than that involved in comparable exclusionary inquiries - e.g. the analysis one would conduct under *Frye*. Kenny describes his criteria as necessary conditions for a field to be scientific and it is that decision, whether it is science or not,

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[5] *Ibid.*
[6] Kuhn (1970), at pp. 19-20.
[7] Kenny (1985), at p. 50.
[8] *Ibid.*

that is determinative for admissibility under Kenny's test. The vexing problem of how to weigh the varying criteria that we encountered with some of the tests discussed in the previous Chapter does not arise since a failure to satisfy any single criterion of the test would result in exclusion.

Kenny's demarcation criteria encounter problem, however, when we turn to a consideration of the principled requirement set out in Chapter 4. Recall that one of the requirements of a principled exclusionary rule was that it would be specific enough to permit distinctions between injurious opinion evidence and non-injurious opinion evidence. There are two ways in which Kenny's proposed criteria fail to meet this requirement. First, let's assume for the moment that he has successfully articulated conditions that are necessary and jointly sufficient to qualify a field as scientific. Kenny's test is *field targeted* rather than targeted upon the specific opinion testimony in question. That is, if the testimony at issue belongs to a field that is scientific under Kenny's criteria, then the testimony would meet the test for admissibility. We must remember, however, that even within fields that are clear pre-theoretic exemplars of science there will be many statements that are clearly speculative and consequently unreliable (at present) from the epistemic standpoint of the law. In recent times, the notorious claim to have discovered a technique for cold fusion, made in 1989 by Dr. Pons and Dr. Fleischmann, and the ostensible detection of gravitational radiation by Dr. Joseph Weber in 1969, provide good examples.[9] Consider Weber's case. Current physical theory predicts that massive moving bodies will produce "gravity waves" that may be analogized to electromagnetic radiation such as radio waves; the principal problem being that such radiation, if it exists at all,

appears to be very weak and difficult to detect.[10] Weber claimed to have devised an experimental device and method to detect such waves. His findings, however, proved difficult to reproduce and the scientific community eventually came to reject Weber's claims.[11] Nobody would dispute, from a pre-theoretic lay standpoint, that physics is a science and at first blush it would appear that, of all candidates, physics is the most apt to meet Kenny's criteria. Despite the scientific status of the field, a speculative assertion concerning the existence of gravity waves from within field of physics, such as we find in Weber's case, remains every bit as speculative as an assertion from astrology or any other exemplar case of non-science. Kenny's criteria therefore fail to provide the means for sifting out the speculative or unreliable claims of a science from those that are reliable.

In the foregoing I assumed that Kenny's criteria do provide necessary and jointly sufficient conditions for demarcating science from non-science. This assumption, however, is far too quick. There are exemplar cases of disciplines routinely characterized as science that would appear to fail to meet Kenny's four criteria and, moreover, non-scientific fields which, in principal, could conceivably satisfy these criteria. Disciplines that are exemplars of science frequently fail to exhibit the conditions identified by Kenny over extended periods of time, and will sometimes fail to exhibit these conditions at a given time. Consider Kenny's requirements of consistency and methodological

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[9] Collins and Pinch (1993); see Chapters 3 and 5.

[10] *Ibid.*, at p. 91.

[11] *Ibid.*, at pp. 94-106. Collins and Pinch utilize this episode as an exemplar case of experimenter's regress. That is, it demonstrates the phenomenon that can occur when the methods and expected outcomes of novel science are unknown. We don't know, for example, that gravity waves exist until we have detected them and that depends on having a good gravity detector. What counts as a "good gravity detector," however, depends on the observed results; but if the experimenter does not know beforehand what the observed results should be, his claims are open to the challenge that his method is responsible for producing misleading results.

consistency. Philosophers of science have long observed that science does not develop in the cumulative manner that many believe is the case.[12] Changes in scientific outlook, what Kuhn calls paradigm shifts, will often bring wholesale changes in what Kenny describes as "questions which are central to [the] discipline," as well as to the methodological commitments of the discipline. The concepts of space, time, and mass from Newtonian physics, for example, occur within the later Einsteinian relativity theory, but with very different ontological commitments; within the Newtonian tradition mass is conserved whereas within the Einsteinian tradition it is convertible with energy.[13] Perhaps this indictment is too harsh. Suppose that we narrow the temporal scope of Kenny's criteria to apply only to periods of what Kuhn calls "normal science;" periods in which science ostensibly exhibits such commitments. Unfortunately, this form of narrowing provides no succor either. Critics of the Kuhnian account have pointed out that the notion of a paradigm, as characterized by Kuhn, is problematic in that it imposes too rigid a structure on the more fluid reality of scientific research traditions.[14] If I am correct that Kenny's criteria reproduces this rigidity, and a literal reading of the standard would rule out an exemplar case of science such as physics, then we must question the adequacy of the criteria for rendering appropriate exclusions in the legal arena.

Finally, there is reason to question whether Kenny's criteria are sufficient to consistently exclude cases of non-science. Falsifiability is a hallmark of much scientific

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[12] See, for example, Kuhn (1970) and Laudan (1977).

[13] Kuhn (1970), at pp. 101-102.

[14] Feyerabend, for example, notes that competing paradigms are commonplace in the history of science; Feyerabend (1970). Laudan notes that Kuhn's account fails to account for the evolution of a scientific paradigm through time; Laudan also notes that Kuhn fails to account for the fact that scientists will often subscribe to the same laws and exemplars while differing on questions of ontology and methodology; Laudan (1977), at p. 75, and 81-86.

inquiry but, as Kenny himself notes, it is hardly a unique characteristic of scientific inquiry.[15] What of the other criteria? Could we conceive of a predictive non-scientific field satisfying these criteria as well? Let's consider astrology. We may begin by noting that the field is predictive. It presents a certain sort of causal story that purports to explain and predict personal characteristics and, to some extent, personal fortunes. Kenny requires that the field must be "methodical" in the sense that its members agree on the procedures to be utilized for inquiry within the field, "cumulative" in the sense that practioners can rely on each other's work, and "consistent" in the sense that practioners must not routinely give conflicting answers to questions that are central to the field. Notice, however, that these criteria are silent as to the form that the methodology, epistemic dependence, and consistency may take. There need only be agreement on methods (however unreliable) by constituent members, consistent agreement as to the central tenets of the discipline and the ability to rely upon the inquiry of others in the field. Astrology has a methodology that is agreed upon by its adherents and it is conceivable that, through nothing more than convention, such adherents could agree to the central questions of the discipline and could agree to rely upon each other. Mere conventional practice does not, however, render 1-900 fortune-tellers practitioners of a science. What Kenny's criteria lack is a specification of the form that scientific methodology takes and the means by which science, as opposed to non-science, produces consistency and epistemic reliance. Given the inability of these criteria to render even the most basic of distinctions between science and non-science one must conclude that Kenny's proposal fails spectacularly to provide a principled exclusionary rule.

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[15] Kenny (1985), at p.50.

5.2 Limpert's Uncertainty Based Approach

Brad Limpert proposes an exclusionary approach for scientific testimony that proceeds by attempting to model uncertainty in science. It is a proposal that marks a useful step toward a truly reliability based exclusionary rule. Rather than attempting to articulate a set of conditions necessary and sufficient to attribute scientific status to an opinion, this proposal simply seeks to provide an answer to the question: is the opinion at issue sufficiently reliable so as to outweigh its potential prejudicial effect? Limpert reasons that scientific practice discloses common processes that, "can be modelled with the goal of detecting the points at which the process introduces uncertainty into the conclusions or opinions presented in the courtroom."[16] The trier of law, equipped with a set of criteria for systematically evaluating the degree to which the science at issue introduces uncertainty into the opinion, is thereby in a position to render a reliability assessment. A number of procedural proposals are also introduced with the aim of enhancing the courtroom application of this approach. I will first discuss the proposed criteria, then some of the procedures proposed by Limpert, and finally evaluate the approach utilizing the criteria articulated in Chapter 4.

Limpert articulates a model of scientific uncertainty that focuses upon seven categories of uncertainty arising within scientific practice. He acknowledges that the categories selected are non-exhaustive and that further articulation of the approach would enhance its usefulness.[17] The proposed categories are thus intended to be a starting point

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[16] Limpert (1996), at p. 84.
[17] *Ibid.*, at pp. 94-95, p. 105.

for a structured, mechanical analysis of the reliability of scientific testimony by trial judges. The categories of uncertainty suggested are:

> (i) Conceptual Uncertainty;
> (ii) Measurement Uncertainty;
> (iii) Sampling Uncertainty;
> (iv) Mathematical Modelling Uncertainty;
> (v) Causal Uncertainty;
> (vi) Testing Uncertainty; and,
> (vii) Communicative and Cognitive Uncertainty.[18]

Conceptual uncertainty concerns uncertainties that arise from the construction of scientific theories to represent natural phenomena. Limpert notes three ways in which this can occur. First, as is frequently noted in the sociology of scientific knowledge literature, observable phenomena will always be consistent with alternate hypotheses. Secondly, relevant variables are sometimes omitted in the construction of scientific theories, "in order to create an analytic structure simple enough to consistently observe, measure, predict, and manipulate."[19] Finally, the application of a scientific theory may lead to incorrect generalizations.[20]

Measurement uncertainty concerns the testing procedures employed by scientists. It arises from the incorrect classification of variables or properties, or from errors, negligence, or outright fraud within empirical testing.[21] Limpert cites, as an example of the first sort of measurement uncertainty, difficulties that are encountered within epidemiological studies in which the effects of unmeasured hazards may be attributed to the hazard that is the object of the study. Accurate data on error rates and laboratory

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[18] *Ibid.*, at p. 84.
[19] *Ibid.*, at p. 86.
[20] *Ibid.*, at pp. 86-87. Limpert notes, for example, where medical generalizations may be made about women on the basis of results from testing males.
[21] *Ibid.*, at pp. 87-88.

reliability would be relevant to any assessment of uncertainty arising from allegations of error, negligence or fraud in the testing procedures employed.

Sampling uncertainty arises from the extent of the empirical testing underpinning scientific claims. Smaller sample sizes increase the probability of identifying false correlations as well as failing to detect deviant samples.[22] Sample size is also critical to establishing the rate of false positives, false negatives and the size of the effect - the error rates that figure in the *Daubert* test and critically in the *J.-L.J.* decision. The suggestion here seems to be that if the sample sizes are insufficient to establish the rate of false positives or false negatives the evidence will be too unreliable.

Scientists utilize mathematical modelling to relate differing variables and properties within theory construction. Mathematical modelling uncertainty can arise, however, when there is insufficient data to define the correct mathematical relationship between the variables and properties.[23] For example, cohort epidemiological studies examine possible risk factors for disease by identifying and following people known to be exposed to the possible risk factor and comparing the frequency that the disease emerges with the frequency of the disease in groups that are known to lack the risk factor.[24] Statistical models are used to attempt to neutralize confounding variables but, if the data is insufficient to identify the correct relationships between variables, the mathematical modelling may result in mis-estimations of the potential risk. In such situations the reliability of the inferences founded upon the mathematical model is questionable. Under this category the trial judge would presumably determine if the data provided is sufficient

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[22] *Ibid.*, at p. 88.
[23] *Ibid.*, at p. 89.

to define the correct mathematical relationship between the variables and properties at play.

The articulation of the causal relations that obtain in the natural world is often regarded as a fundamental feature of scientific explanation. Limpert notes that science seeks explanations of causal mechanisms because mere statistical correlations do not necessarily disclose cause and effect.[25] The lack of any causal account linking purported causes and effects therefore introduces uncertainty in the form of the possibility of random correlations or unidentified causes. Limpert endorses seven criteria for assessing the adequacy of causal explanations:

> 1. Causes must precede effects;
> 2. Causes and effects must occur at the same physical location or be linked by some mechanism;
> 3. Deletion of the cause must eliminate the effect;
> 4. The causal mechanism must be shown to work in more than one system;
> 5. There must be enough of the causal agent to result in the observed magnitude of the effect;
> 6. The techniques used to detect cause and effect must be specific enough to screen out alternative causes;
> 7. The observed effect must be reproducible.[26]

Under the category of causal uncertainty a trial judge would consider the strength of the causal explanations underlying the scientific testimony. Very strong statistical evidence, Limpert suggests, would reduce the need for causal explanation since the probability of a random correlation would be low. Where, however, the statistical evidence linking the proposed cause and effect is weak, the need to identify a causal mechanism will be greater.

The category of testing uncertainty arises at the intersection of some tensions between the requirements of epistemically useful experimentation and the practical

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[24] Foster and Huber (1997), at p. 71.
[25] *Ibid.*, at p. 90.

features of experimentation. Limpert approvingly notes Popper's dictum that meaningful experimentation requires observational consequences that could disprove the hypothesis being tested. Tests must therefore, "have variety and severity: variety because the same test yields little new information, and severity, because the theory is only tested by experiments that have a genuine expectation of disproving the theory."[27] Practically, however, a degree of replication is necessary to provide a measure of assurance as to the accuracy of the results. Nor is there any magic bell in actual practice that chimes to tell the inquirer when the hypothesis at issue has been put to a severe enough test. The implication of Limpert's analysis under this category seems to be that as the scientific opinion at issue becomes more complex or speculative, trial judges should seek greater variety and severity in the support for the underlying opinion than would be the case with what Popper would call "well-corroborated hypotheses."

The last of Limpert's categories of uncertainty, communicative and cognitive uncertainty, refers to the uncertainty that may arise in the transmission of scientific knowledge to non-expert lay knowers. Under this category we find many of the difficulties that have already been articulated in Chapter 3 with respect to lay evaluations of science. Limpert notes three such difficulties: unawareness of important background information necessary to drawing correct inferences; secondly, the common difficulties associated with evaluating statistical information; and finally, layperson difficulties in aggregating information about uncertainty.[28] Under this category a trial judge would

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[26] *Ibid.*

[27] *Ibid.*, at p. 91.

[28] *Ibid.*, at pp. 92-93. With respect to the last of these, Limpert observes, "When presented with information that is somewhat uncertain fact-finders have a tendency to treat it as entirely reliable or entirely

presumably assess the impact of these communicative difficulties with respect to the particular science at issue in the trial.

With these criteria for evaluating uncertainty in hand, let's move to consider the procedures that Limpert envisions. In Chapter 3, I argued that part of the difficulty in trier of fact assessments of science within a purely inclusionary approach rests in placing science within the adversarial context of legal inquiry. Limpert concurs with this concern and suggests a number of procedures that, together with his proposed uncertainty based admissibility test, would "improve the nature of scientific testimony." Part of the problem, he suggests, is that in many jurisdictions triers of law are late to realize pending difficulties arising from scientific testimony.[29] Limpert suggests that parties to the proceeding intending to present scientific evidence should give notice, and provide affidavits describing the evidence from the experts, to the court and each other well before trial.[30] This documentation would be aimed at satisfying the court that the

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unreliable." In Chapter 3, I argued that this strange tendency arises because of, one the one hand, the potency in the popular imagination of scientific authority, and on the other hand, the skepticism that can arise when this popular imagine appears frustrated.

[29] Limpert offers several other, more esoteric, procedural suggestions beyond those that I will canvass here. For example: (i) "establish a procedure to choose the court-appointed expert;" (ii) "allow juror note-taking and questioning [of the witness];" (iii) "spend more resources on education about scientific issues for judges, lawyers, and law students;" and, (iv) do away with the requirement of hearing all of a party's evidence before hearing from the other party in respect of scientific evidence. Limpert notes that the latter three are not as important as the need for pre-trial notice and early identification of difficulties arising with the scientific testimony. *Ibid.*, at pp. 103-104. Limnpert's principal procedural suggestion, regarding pre-trial disclosure, is not without difficulty (see below).

[30] *Ibid.*, at p. 102. There are comparable procedures already existing within civil procedure in Canadian jurisdictions. See, for example, Rule 218 of the Alberta Rules of Court. I discuss some of these procedures further in Chapter 7. It should also be noted that there are difficulties associated with the pre-trial disclosure of evidence and the debate in the legal community remains unsettled. For example, in the context of criminal procedure, defence disclosure of evidence prior to trial invites the objection that this interferes with a defendant's right to make full answer and defence; I discuss this issue further in Chapter 7. Legislators have nonetheless, recognized the potential advantages, as Section 657.3 of the *Criminal Code* seems to indicate. There is also some concern that this sort of procedure would involve the assignment of judges to a case well before trial and thereby could promote 'judge shopping.' I am at a loss

proposed evidence is reliable under the uncertainty-based standard. Parties would then be required, "to respond to the other party's expert report, identifying and commenting on areas of agreement and disagreement."[31] The trier of law would then review the submissions of the parties to determine if the proposed testimony meets the standard. Should this be the case, the expert would testify at trial and the pre-trial reports would be accepted as evidence in the hearing. If, however, these pre-trial submissions disclose conflict, or if concern arises as to the uncertainty of an expert's testimony, the trier of law would have to render a determination of admissibility. This might entail requiring the parties to provide further information, some form of a pre-trial hearing, or the appointment of an independent expert to assist the trier of law in understanding what is required to render a determination of admissibility.[32] Should this assessment lead to the conclusion that some proposed testimony discloses too much uncertainty under any of the exclusionary criteria, the trier of law would presumably rule that the testimony is inadmissible at trial.

Let's assess Limpert's uncertainty based exclusionary test on the basis of the criteria articulated in Chapter 4. Does this proposal provide an efficient basis for determining the admissibility of scientific testimony? The procedure envisioned is comparable to other legal procedures and, while requiring notice and the submission of pre-trial expert reports adds some to the cost, and potentially to the time, of the proceeding, there are clear advantages that would accrue (given a successful standard).

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to discern any substantial difference that the procedure would make in this regard provided, of course, that judges are still assigned to files randomly.

[31] *Ibid.*

[32] *Ibid.*

Notice and the submission of pre-trial reports would allow the parties to determine if they were going to make the science an issue. It would also alert the trial judge to any conflict or difficulty regarding the proposed testimony and allow time for the resolution of the admissibility issue prior to trial. Limpert's focus appears to be on the civil side of the bar where there is perhaps greater latitude for the measure of disclosure envisioned by his proposal. With respect to criminal matters, however, the notion of pre-trial disclosure by the defence of any proposed expert testimony runs into resistance on a legal basis. In Canada, the defence is under no obligation to disclose evidence and any erosion of this would likely encounter legal challenge; for example, argument that such a requirement violates a defendant's right to full answer and defence. This, however, is not so much an efficiency concern as a concern with the feasibility of implementing the proposal; I will bracket this concern for the time being and return to the matter when I come to discuss my own proposal in Chapter 7.

Returning to the issue of the efficiency of Limpert's standard, we may observe that the criteria articulated can be straightforwardly formulated in terms of a legal test. Limpert also describes these criteria as "mandatory."[33] Thus, a failure to meet a sufficient degree of reliability with respect to any one of the criteria would result in a determination of inadmissibility. This is preferable to the sort of situation discussed with respect to the *Daubert* standard, and the revised Rule 702 of the U.S. Federal Rules of Evidence, in Chapter 4. With the *Daubert* standard the trier of law is left with no basis for weighing the factors against each other or for determining how their satisfaction or non-satisfaction would contribute to a ruling. While Limpert's test admits of a more structured analysis by

trial judges of putative opinion evidence it, nevertheless, raises some comparable concerns when one examines the criteria more closely.

The principal efficiency concern that I envision with Limpert's proposal concerns his articulation of the criteria. He acknowledges that the test, "does not provide a simple mechanical test,"[34] and that, "it gives few specific insights or guidelines."[35] It is conceivable that an actual test could add more specific guidelines. Granting this, however, it would still appear to be a difficult task for the relatively inexpert trier of law to assess the extent of the uncertainty under the various headings in cases of complex scientific testimony. When, for example, would the fact that a given set of observations supports more than one theory (conceptual uncertainty) lead to a determination that the theory at issue is too uncertain to go before a trier of fact?[36] To some extent, virtually all of the uncertainties Limpert addresses are endemic to scientific practice. For triers of law to efficiently apply these criteria they must have sufficient background knowledge concerning what reasonable levels of uncertainty are within the sciences or, minimally, sufficient guidance built into the articulation of the criteria.[37] Absent this sort of guidance with respect to the categories, or some other means for accomplishing this task, the

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[33] *Ibid.*, at p. 94.
[34] *Ibid.*, at p. 93.
[35] *Ibid.*, at p. 95.
[36] This category, I submit, is the weakest of those he provides. It is a feature of empirically based theorizing that our observations will always be consistent with alternative accounts of the data. While all of the criteria Limpert articulates are, to some extent, implicated in scientific practice, this one is the most difficult to quantify in any useful way.
[37] It is conceivable that the parties could submit evidence to the trier of law that would speak to whether or not the expert's testimony satisfies these criteria. We must remember, however, that the responsibility to determine reliability rests with the trier of law and the potential dangers associated with the partisan presentation of science. While this sort of supporting evidence is necessary to the judge's assessment of whether the proposed testimony meets the standard, presumably on the civil burden of proof, it should not be a substitute for the judge's own understanding and interpretation of the standard.

ability of triers of law to understand the test well enough to apply it, is cast into some doubt.

Does this standard provide a principled basis for exclusion? All of the criteria resonate with sources of uncertainty, and thus potential unreliability, in scientific claims that philosophers studying scientific practice will find familiar. While Limpert notes that the list is non-exhaustive (i.e. there may be other unidentified sources of uncertainty that could lead to the admission of unreliable testimony should the identified criteria be met), the successful application of these criteria would result in the exclusion of testimony that is, in fact, unreliable under the various categories. Limpert provides a case study to illustrate how he envisions his procedures working within a trial context. The matter concerns a toxic tort case in which the plaintiffs alleged that a toxic chemical (TCE), buried in the ground by the defendant company, was responsible for contaminating their drinking water and causing leukemia and immune-system suppression.[38] The time the waste was deposited proves to be a crucial contested issue of fact and the defendant called expert scientific evidence concerning a procedure for establishing the time. It is claimed that the chemical, "was decomposed by micro-organisms into another chemical (PVC) and so by determining when PVC was detected in the ground it would be possible to calculate when the toxic chemical had been buried."[39] The procedure proposed by the defendant's expert was disputed by experts for the plaintiffs and, in the action upon which the example is based, the contested opinion was allowed to go before the jury. Under Limpert's suggested procedures, the parties and the Court would be aware of the

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[38] *Ibid.*, at p. 105.
[39] *Ibid.*

nature and problems associated with the proposed testimony well in advance of trial. The uncertainty-based criteria would be utilized to render a determination of the reliability of the evidence:

> [T]he judge could have used the model presented in this paper to evaluate uncertainty in the evidence. The judge could have considered conceptual uncertainty: Could the PVC have been deposited in the ground in another way? No testing had ever been conducted to determine whether micro-organisms decomposed TCE into PVC. Was there any evidence that similar chemicals were decomposed in this way? Next, measurement uncertainty could be considered: Were the measurements of PVC accurate? Then, sampling uncertainty could be evaluated: Did the soil samples that contained PVC accurately assess all sources of contamination of the drinking water? The expert testified that decomposition would take three to six years. The judge may have wanted to examine mathematical models that supported this prediction to assess mathematical uncertainty. The expert was unable to describe "the exact mechanism by which these soil bugs broke down TCE." No evidence was given about whether the micro-organisms lived in the same location as the toxic wastes or whether there were enough micro-organisms to break down all the toxic chemicals. Causal uncertainty was very high because the expert's theory was almost entirely speculative and no testing had occurred. Finally, the judge could have considered communicative and cognitive uncertainty. Although no complex statistics were presented, the jury may have overvalued the information by assuming that decomposition of a complex chemical by micro-organisms occurred in the same way as decomposition of household or garden wastes.[40]

With the exception of "communicative and cognitive uncertainty," which concerns the reliability of information transmission rather than the reliability of the testimony itself, the factors selected for consideration under this test are all ones that have direct significance for the epistemic evaluation of a scientific claim. Allowing for the fact that the test is non-exhaustive, the proposed standard does seem to provide sufficient specificity within its given parameters. That is, the factors identified, if successfully applied, would permit distinctions between injurious (unreliable) and non-injurious (reliable) testimony.

The uncertainty model for exclusion does, nevertheless, admit of some concerns on principled grounds. In discussing the efficiency of the model, I noted that it fails to

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[40] *Ibid.*, at pp. 105-106.

provide triers of law with the guidance concerning the criteria that would be appropriate to rendering determinations concerning the point at which a given category of uncertainty renders the testimony too unreliable to go before the trier of fact. For example, on what basis is the trier of law to assess measurement uncertainty in some proposed testimony?[41] Assuming that the trier of law is able to do so - if, for example, there is data available on error rates and the like - how much measurement uncertainty is too much? Suppose the testimony concerns blood type identification and there is data purporting to show that the lab rendering the analysis has a 10% error rate in such analysis. Is this too much uncertainty? Or is such an error rate more a matter of the weight of the evidence that should be left to the trier of fact? Given the relative inexpertise of trial judges to render these assessments, and the lack of guidance as to what reasonable levels of uncertainty are under the standard, there is a danger of considerable inconsistency in determinations of reliability under this test. While this objection raises a legitimate concern with the Limpert's proposed standard, it should not, I submit, speak decisively against the notion of a reliability-based standard along similar [improved] lines. We could articulate some of the categories suggested in ways that would enhance their application. Limpert also suggests that there may be a role for independent court-appointed experts to assist judges in understanding what they need to in order to apply the criteria.[42] Both of these are useful suggestions that I will take up further when return to discuss a reliability-based exlusionary standard in Chapter 7.

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[41] Limpert notes that, concerning some of his categories of uncertainty, there is very little data available that would assist triers of law. *Ibid.*, at p. 88.

5.3 Underlying Problems with Demarcation

I have thus far examined a number of exclusionary approaches found in case law (Chapter 4) and scholarly literature (Chapter 5, Sections 5.1 and 5.2), and found them wanting. There is an underlying problem that figures in all of the tests discussed except for that of the uncertainty based approach canvassed in the previous section. At the outset of Chapter 4, I spoke in terms of the need for an exclusionary test that distinguishes injurious testimony from non-injurious testimony. What, however, is it for the testimony to be epistemically injurious? The answer follows from the epistemic motivation of the exclusionary approach and it has figured in a number of my critiques of the tests canvassed thus far. Lay triers of fact cannot be expected to render determinations of epistemic reliability regarding scientific testimony in the context of a trial. The trial process must therefore provide a screening process to ensure that if scientific testimony is to go before a jury, it meets a specified threshold of epistemic reliability. The underlying problem concerns the nature of the demarcation that many tests tend to make. Rather than attempting to demarcate between reliable [scientific] testimony and unreliable testimony they often end up attempting to answer what is called the 'demarcation problem' within the philosophy of science. That is, they attempt, for courtroom purposes, to distinguish science from non-science. This is explicitly the case in Kenny's proposal but less obvious in the case law standards of *Frye*, *Daubert* and *J.-L.J.*. I will begin here by discussing how most of these case law standards fall into the demarcation debate and then articulate why attempting to demarcate science from non-science is philosophically problematic. I

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[42] *Ibid.*, at pp. 102-103.

will then argue that the philosophical difficulties plaguing demarcation illuminate many of the principled problems cited against the case law standards.

A useful point in understanding whether a test is in the business of demarcating science is to examine where the test locates the determination of epistemic reliability. If the test is one where the criteria attempt to pick out features of science, without engaging the issue of whether those features are indeed indicators of epistemic reliability, then the entire weight of that epistemic determination falls upon the science/non-science distinction. Such a test is better characterized in terms of attempting to demarcate, or distinguish, science from non-science. Let's begin by looking at the *Frye* test. The general acceptance criterion of the *Frye* standard is one that keys upon a supposed characteristic, general acceptance, of science. Could we not construe this as a reliability standard of a purely epistemic sort? In Chapter 4, I argued that general acceptance is a surrogate indicator of reliability. If the methods and procedures employed by the field are reliable, general acceptance of a theory by that field may indeed indicate epistemic reliability. Without that wider story concerning methods and procedures employed by a given community of inquirers, there is nothing in the fact of general acceptance itself that necessarily connects community acceptance to epistemic reliability. In its decision the *Frye* Court makes no effort to provide any of that wider story concerning the actual methods and procedures employed. Thus, when the *Frye* Court speaks of a "scientific" principle or discovery crossing the line "between the experimental and demonstrable stages"[43] the only line in sight is that between science and speculation or non-science. The Court assumes that general acceptance is a distinguishing feature, or demarcation

criterion, between science and non-science. Furthermore, it is upon the distinction between science and non-science that the entire weight of epistemic evaluation falls. That is, the Court also assumes that science is epistemically benign, and admissible, whereas opinion that has not crossed this line to become 'scientific' is epistemically dangerous and inadmissible.

This story is more complex with the *Daubert* (and *J.-L.J.*) criteria for we find language that explicitly indicates that, in exercising his gatekeeping role, the trier of law is to render a determination of the reliability of the evidence. This is even more the case now, when *Daubert* is read in light of the revised Rule 702 of the U.S. federal Rules of Evidence. The *Daubert* Court notes that the admissibility of the testimony will depend upon its evidential reliability where, with scientific testimony, this will rest in the "scientific validity" of the opinion.[44] The mention of reliability is initially promising but, as I noted in Chapter 4, validity is a logical notion and it seems unlikely that the *Daubert* Court utilized the term in this technical sense. From the context of the decision it appears more likely that the Court utilized the term in the layperson's sense of 'scientifically well-confirmed' or 'scientifically accepted.' While two of the *Daubert* criteria could, with further guidance, feature in an exclusionary test targeted on the epistemic reliability of the opinion (empirically testable and tested, and the requirements of reliable methods/error rate specification), the sparse checklist quality of the test runs the risk that the criteria will be applied unreflectively or mechanically. Lacking the guidance within the procedure to make independent assessments of epistemic reliability, trial judges may simply examine

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[43] *Frye* v. *United States,* 293 F. 1013 (1923) at 1014.

[44] *Daubert* v. *Merrell Dow Pharmaceuticals, Inc.,* 113 S.Ct. 2786 (1993),at p. 2795, footnote 9.

proposed testimony to determine whether it conforms to the form rather than the substance of the test. For example, in assessing whether the matter of testimony is empirically testable and tested, there is a danger of trial judges looking merely to determine if there are references of empirical testing without adequately considering the epistemic reliability of that testing. We must also remember that two of the criteria, peer review and general acceptance, are surrogate indicators of reliability. They are thus even more prone to sliding into a focus upon features of science rather than an evaluation of the reliability of the opinion itself. When one approaches the standard in this manner the determination becomes one of whether the opinion conforms to certain features of science and, once again, it is the science/non-science distinction that ends up carrying the weight of a determination of epistemic reliability. To be clear, I am not asserting that U.S. Supreme Court meant the *Daubert* standard to be one that demarcates science from non-science, or that the criteria of the standard unequivocally are ones that focus upon this distinction. My claim is that, without more, there is a real risk that the standard is applied as one that focuses on the science/non-science distinction.

At this juncture a brief philosophical interlude to consider the problems associated with demarcating science from non-science is in order. Many would adhere to the claim that science, characterized generally, provides the most reliable form of human inquiry. This is not a claim that I wish to dispute here. Assuming for the sake of argument that such proponents of science are correct: what is wrong with the attempt to construct an exclusionary test on the basis of demarcating science from non-science? To begin to see what is wrong, let's start by examining the problems associated with this endeavour in its philosophical context. Two problems warrant our consideration. First, the effort to

provide a philosophically adequate demarcation between science and non-science has proven immensely challenging. Secondly, an examination of what we commonly describe as science reveals that there is no necessary connection between the ascription of scientific status to a theory or technique and the epistemic reliability of that theory or technique.

In order to examine these problems with demarcation we should first consider the *desiderata* of a philosophical demarcation criterion. In his influential paper on the subject, "The Demise of the Demarcation Problem," Laudan identifies three considerations that are useful to this task. First, there are conditions of adequacy. By this Laudan means that, "Any proposed dividing line between science and non-science would have to be (at least in part) explicative and thus sensitive to existing patterns of usage."[45] This is a familiar philosophical requirement - indeed one could characterize it as the philosophical method - namely, that whatever definition we arrive at should conform to our settled intuitions regarding paradigm cases of what we would classify as science and what we would classify as non-science. Moreover, it should do so in a philosophically significant way; for example, by identifying the epistemic or methodological features that distinguish scientific activity from non-scientific activity.[46] Secondly, there is the more formal requirement of stipulating necessary and sufficient conditions for science. To offer less as a definition would not serve the task the demarcationist seeks; i.e. unequivocal classifications of what is science and what is not scientific.[47] Offering less leaves us with

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[45] Laudan (1983), at p. 117.
[46] *Ibid.*, at p. 118.
[47] *Ibid.*, at pp. 118-119. Offering a definition in terms of necessary conditions alone would leave open the possibility that the field possessing the conditions actually isn't scientific, and offering a definition in terms

merely conventional or pragmatically founded classifications that would not support the epistemically normative aim of demarcation. The third consideration is not so much a *desideratum* of a demarcation criterion as a cautionary warning. Laudan notes that, "labeling a certain activity as 'scientific' or 'unscientific' has social and political ramifications."[48] In previous chapters I have already noted the "mystique of scientific authority." The 'mystique' of this label in our society can carry with it significant weight in matters of public policy. As such we should be wary of ulterior motives that may be underlying the proposal of a demarcation criterion.[49] The desire to produce a trump card in a wider polemical debate should not be seen to be driving the proposal of a demarcation criterion.

The legacy of attempts to satisfy the above *desiderata* for a philosophically significant demarcation criterion does not inspire confidence. Until the nineteenth century the commonly shared basis for demarcation rested in the belief that apodictic certainty distinguished scientific knowledge from other sorts of beliefs. This was part of Aristotle's influential demarcation and this notion of the infallibility of scientific knowledge was retained through the Rennaissance long after other aspects of the Aristotelian demarcation were largely abandoned.[50] By the nineteenth century, however, most philosophers,

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of sufficient conditions alone would leave us in a position where we could not say that a field or activity is unscientific.

[48] *Ibid.*, at p. 120.

[49] *Ibid.*, at p. 119. Laudan notes Popper's notorious desire to discredit Marxism and Freudianism with the status of unscientific theories.

[50] *Ibid.*, at pp. 112-114. The Aristotelian demarcation had two components. First, scientific knowledge concerned universal first principles of nature directly intuited from sense. Secondly, scientific knowledge was "demonstrative understanding," knowledge of why, as opposed to mere descriptive and 'knowing-how' knowledge. The latter distinction was largely abandoned by the eighteenth century, as was the notion that scientific knowledge had to rest upon knowledge of primary causes or essences. What was retained across very diverse thinkers, Laudan notes, was, "the claim that science and infallible knowledge are co-terminus." *Ibid.*, at p. 114.

impressed by the corrigibility of scientific theories, embraced a fallibilistic epistemological approach that necessarily demolished the older demarcation tradition founded upon the infallibility of scientific knowledge.[51] Nineteenth century efforts to provide a satisfying demarcation within the parameters of a fallibilist epistemology settled on the notion of a methodological distinction: what differentiated science from non-science was the possession of the scientific method that, while fallible, was nevertheless more conducive to truth seeking than the methods or processes of non-science.[52] We find Whewell, for example, writing that the scientific method is characterized by the "consilience of inductions" that it achieves:

> No example can be pointed out, in the whole history of science, so far as I am aware, in which this Consilience of Inductions has given testimony in favour of an hypothesis afterwards discovered to be false.... [W]hen the hypothesis, of itself and without adjustment for the purpose, gives us the rule and reason of a class of facts not contemplated in its construction, we have a criterion of its reality, which has never yet been produced in favour of falsehood.[53]

These approaches foundered in the difficulties of articulating what constituted the scientific method in a way that reflected the practice of actual scientists in many diverse disciplines.[54] The historical methodologically based demarcations were also unable to articulate why beliefs generated according to these methods were more deserving of the appellation of knowledge, or even demonstrate that they were epistemically superior than to the ostensibly non-scientific rivals.[55]

Twentieth century attempts to demarcate science from non-science shifted from epistemic and methodological approaches to semantic and syntactically founded

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[51] *Ibid.*, at pp. 114-115.
[52] *Ibid.*, at pp. 115-116.
[53] Whewell (1989), at pp.154-155.
[54] Laudan (1983), at p. 116.
[55] *Ibid.*, at pp. 116-117.

distinctions. The principal candidate approaches of this period were verificationism and falsificationism. The logical positivists of the first half of the twentieth century explicitly rejected the notion that apodictic certainty was the hallmark of science, and instead proposed that propositions were scientific if they possessed determinate meaning.[56] Determinate meaning rested with analytic propositions and empirically verifiable propositions.[57] Verificationism proved unsalutary as a demarcation criterion, however, since it did not accord well with our actual distinctions between paradigm cases of science and non-science. On the one hand, exemplars of science do employ statements, "not open to exhaustive verification (e.g., all universal laws)," and on the other hand, many paradigm cases of non-science do employ statements for which, "we can specify a class of possible observations which would verify [them]."[58] Popper's falsificationism stood as a rival to the verificationism of the period. Impressed by the apparent insolubility of Hume's problem of induction, Popper sought to characterize scientific explanation, and with it establish a demarcation criterion, through the notion of falsification. Scientific statements, Popper argues, are statements that are falsifiable in principle. This approach falls prey to the same objection that troubles verificationism. Any theory, however unscientific under the actual distinctions we typically render, will turn out to be scientific provided that the theory "makes ascertainably false assertions."[59] These semantic and syntactic strategies of the first half of the twentieth century fail precisely because they abandon any attempt, as was the case with the older demarcation tradition, to provide an

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[56] *Ibid.*, at p. 120.
[57] See, for example, Ayer (1952), at pp. 5-16.
[58] Laudan (1983), at pp.120-121.
[59] *Ibid.*, at p. 121.

epistemically normative demarcation.[60] The semantic and syntactic strategies simply fail to provide the resources for an adequate demarcation.

Other candidates for demarcation have been floated. One might seek to demarcate science on the basis that a scientific claim, in contrast to a non-scientific one, is well tested. One might also seek demarcation in the notion that science alone demonstrates epistemic progress, or that science is "the only form of intellectual system-building which proceeds cumulatively," or that it alone exhibits what Whewell describes as a consilience of inductions.[61] One might also seek to demarcate science from non-science on the basis that science alone provides useful knowledge. All of these suggestions fail in terms of providing necessary and sufficient conditions. The results fail to conform to our common usages of the terms science and non-science.[62] The criterion on well-testedness, for example, seems incapable of either excluding paradigm cases of non-science or capturing paradigm cases of scientific claims. Many assertions in non-scientific fields are very well-tested through common experience - in many cases much more so than what we find in scientific practice.[63] Conversely, while testing is a feature of scientific practice, many scientific claims - the cosmological claims of physics for example - are not well-tested at all. Indeed, all scientific claims *begin* as untested hypotheses.

The upshot of the foregoing argument is that fulfilling the *desiderata* for a demarcation criterion isn't in the deck, so keying upon the science/non-science distinction

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[60] *Ibid.*, at pp. 121-122. An interesting inference that one may draw from Laudan's analysis is that an adequate demarcation criterion, if one is actually ever generated, is going to turn out to be one founded upon epistemic conditions. This betrays some sense that science, pre-theoretically construed, does represent our most reliable form of inquiry.

[61] *Ibid.*, at pp. 122-123.

[62] *Ibid.*, at p. 123.

[63] *Ibid.* Laudan uses literary theory, carpentry and football strategy as examples.

is not very helpful. The first leg of the argument is "that we are warranted in saying that none of the criteria which have been offered thus far promises to explicate the distinction."[64] This is a form of the 'pessimistic induction.' The past repeated failures to provide an adequate demarcation criterion suggest that no future attempt will succeed. Of course, past failures do not, in principle, demonstrate the inability to demarcate science from non-science but, as an observation concerning the past and present philosophical state of the matter, the argument does suggest that our philosophical caution about a demarcation criterion is fair enough. Why, however, should this piece of philosophical caution extend to the legal arena? Could we not say that, for the purpose of the law, a 'rough and ready' distinction between science and non-science will suffice? In order to understand why the science/non-science distinction proves equally unsalutary from a legal standpoint the second leg of the philosophical argument is critical.

The second point that figures in rejecting the philosophical demarcation project is more telling from a principled standpoint. In the above discussion of recent gestures toward a demarcation criterion, I noted that the practice of disciplines regularly regarded as scientific discloses considerable epistemic heterogeneity. The underlying assumption of an epistemically founded distinction between science and non-science is that there are ascertainable epistemic invariants common to all scientific practice.[65] If in fact no such invariants, applicable only to the sciences, are to be found, then the prospect for an epistemic demarcation that presupposes such invariants is stillborn. The sort of historical analysis of demarcation attempts that Laudan presents us with is consistent with the

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[64] *Ibid.*, at p. 124.
[65] *Ibid.*

conclusion that there are no such epistemic invariants; if science discloses no epistemic invariants we should not be surprised at the failure to articulate a demarcation between science and non-science founded upon the assumption of such invariants. Why should this matter for the legal arena? The goal of an exclusionary test, in this instance, is to enable a trier of law to exclude unreliable evidence that could prejudice the proceedings. If the weight of determining whether the evidence is unreliable falls upon the science/non-science distinction, then the inability to find the epistemic invariants that mark out science as reliable is also going to be a problem for an adequate legal test. There will be examples that conform to what such a test would call 'science' that are, nevertheless, epistemically unreliable and, quite possibly, examples that are epistemically reliable that would not conform to what such a test would call 'science.' This was one of the recurring themes in my analysis of existing legal standards, such as *Frye* and *Daubert*, that utilize surrogate indicators of reliability and, explicitly or implicitly, rely upon a checklist of scientific characteristics to do the work of evaluating epistemic reliability.

The line of argument I have been following leaves us, it seems, with an important caution against formulating an evidentiary standard that keys upon demarcation as well as the suggestion that many of the difficulties identified with the standards canvassed in Chapters 4 and 5 may actually stem from the principled difficulties associated with demarcating science from non-science. This should suffice, I submit, to discourage attempts in the legal context to formulate an exclusionary test on the basis of this distinction. Should these difficulties lead us to reject the exclusionary response to the problems associated with scientific testimony? While there are challenging difficulties

associated with the formulation of an adequate exclusionary standard there is, nevertheless, reason to believe that we could do better.

Laudan's analysis of the philosophical history of the demarcation project offers some support to the contention that we can do better. While he disparages the project of establishing a demarcation criterion, he nevertheless does not explicitly reject the *epistemic* project of distinguishing between reliable and unreliable knowledge. Given the historical analysis, it is tempting to suggest that the question of whether a belief is properly scientific became conflated in the history of Western philosophy with the question of whether a belief is reliable.[66] In the legal arena, this same conflation appears even better confirmed by such pronouncements as, "evidentiary reliability will be based upon scientific validity."[67] While the question of demarcation is problematic, the question of the reliability of beliefs, Laudan suggests, is very much alive:

> In asserting that the problem of demarcation between science and non-science is a pseudo-problem (at least as far as philosophy is concerned), I am manifestly not denying that there are crucial epistemic and methodological questions to be raised about knowledge claims, whether we classify them as scientific or not. Nor, to belabor the obvious, am I saying that we are never entitled to argue that a certain piece of science is epistemically warranted and that a certain piece of pseudo-science is not.[68]

This conclusion, I suggest, has importance for our efforts to address the issue of scientific testimony in the legal arena. It is innocuous enough, purely as a matter of legal taxonomy, to characterize the category of opinion evidence that we are considering here as scientific opinion evidence. As I have already noted, the lessons of philosophical attempts to demarcate science from non-science should lead us to reject attempts to replicate this distinction in the context of formulating a standard for the admissibility of

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[66] *Ibid.*, at p. 125.

[67] *Daubert* v. *Merrell Dow Pharmaceuticals, Inc.*, 113 S.Ct. 2786 (1993), at p. 2795.

scientific testimony. Perhaps we should take Laudan's conclusion further in the legal context and, instead, seek an admissibility standard for scientific testimony that focuses primarily upon considerations of epistemic reliability.[69] Limpert's proposal, discussed in Section 5.2, takes an important step beyond the present case law toward such a reliability-based approach. In Chapter 7, I will take this approach further in my own recommendation.

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[68] Laudan (1983), at p. 124.

[69] I say "primarily" here rather than "purely" for reasons that will be set out in Chapter 7, Section 3.

Chapter 6 – Non-Adversarial Alternatives

In the previous three chapters I examined two sorts of legal response to the concerns posed by the use of scientific testimony in the courtroom. Based on the epistemology of testimony articulated in Chapter 2, and the Chapter 3 application of this epistemology to the law, I argued that the inclusionary approach fails to meet the internalist epistemic needs of the law; the law of evidence needs to be supplemented with some form of paternalistically motivated screening of evidence. In the last two chapters, however, we encountered some of the more notorious difficulties associated with the formulation and implementation of an exclusionary rule of evidence. In this chapter I will begin by briefly considering some suggestions, ranging from the banal to the exotic, for improving the use of science in our courts. From there I will move to a consideration of some of the more radical proposals for reform.

The difficulties that I identified in the previous three chapters, together with the belief that our adversarial legal context provides a poor venue for rendering determinations of scientific reliability, lead some commentators to propose the introduction of non-adversarial processes for accomplishing the same ends served by an exclusionary approach. The greater balance of this chapter shall consider the influential article by John Langbein, "The German Advantage in Civil Procedure," that has motivated many of these non-adversarial proposals and then examine the recent specific proposal made by Alvin Goldman that attempts to incorporate significant features of a non-adversarial approach within our own adversarial context. My task here shall be: (a) to articulate Goldman's alternative and the means by which he proposes to address the problem of scientific testimony; (b) to critically evaluate this alternative utilizing the

Chapter 4 criteria for assessing exclusionary approaches; and (c) to introduce considerations from the political morality of the adversary system into an assessment of this approach.

6.1 Exotic and Banal Alternatives

What are the cogs within the machinery of the legal system where scientific testimony comes into contact with the process? Three such points of contact are readily identifiable in our system: there are the lawyers who are responsible for the presentation of the testimony (and the challenge of opposing testimony); there are the judges that must make evidentiary rulings of law; and there are the triers of fact that must hear the testimony and render a factual determination. My characterization of the topography of the issues involved with scientific testimony has followed from reflecting on the epistemological principals that underlie our law of evidence. There are, however, other ways of reflecting on the matter. From a problem solving standpoint one might also characterize the topography of the issues in terms of the points of contact that scientific testimony has with the legal system. What I call the inclusionary approach, for example, is a lawyer-centred approach to the issues. It takes the role that the lawyer has in presenting and challenging scientific testimony to be the crucial one in dealing with the epistemic challenges posed by such evidence. The exclusionary approach is a judge-centred approach. It seeks to respond to the epistemic challenges by introducing standards that triers of law must apply to determine admissibility. Further reflection on these points of contact assists us in generating some of the more exotic (and sometimes simply bizarre) suggestions. In this section I will to utilize this 'points of contact' perspective to

briefly canvass some of these suggestions (numerous examples of which can be found in any cursory investigation of the legal literature on this subject).

Lawyer (or Partisan)-Centred Responses

Our adversarial system of law is a partisan system. That is, the parties to the proceeding undertake the active role within legal inquiry, in particular by their advocates. Parties, however, are 'interested' participants to the process and many of the concerns raised in the preceding chapters can be attributed to, or exacerbated by, party control over the selection of the expert witness and the examination of witnesses at trial. An approach that keys on this feature might, for example, require parties to select experts from pools or lists of approved experts generated by the relevant extra-legal professional associations. The reasoning behind this suggestion is that such bodies would be responsible for standards of reliability appropriate to the area of expertise and, consequently, that the potential for fringe science to creep into the inquiry would be greatly lessened. This sort of proposal is, in effect, a simple version of what I term a non-adversarial response. Of course, this proposal still provides parties with considerable latitude in the selection and questioning of witnesses; features that the more radical approaches discussed in Sections 6.3 and 6.4 depart from even further. The difficulties with this simple proposal are much the same as those encountered with the radical approaches that I will examine in due course so, for the moment, let's turn to look at judge and juror centred responses to the difficulties associated with scientific testimony.

Judge-Centred Responses

One of the recurring concerns in Chapters 4 and 5 was with the ability of triers of law to render apt determinations regarding the admissibility of scientific testimony under various exclusionary procedures. Judges are experts of a sort but, as I argued in Chapter 4, their expertise is with the law.[1] In most cases this expertise does not extend to making determinations of scientific reliability; most judges are no better positioned in respect of their background knowledge than laypersons to evaluate scientific merit or reliability. This leads some to focus upon reforms to the judicial handling of scientific testimony. On the milder end of this scale, there is the suggestion that judges require a greater knowledge of science to discharge their duties. We should therefore provide judges with remedial science training or require them to possess minimum thresholds of scientific knowledge.[2] If judges were better informed scientifically, the reasoning goes, they would be better able to exercise their gatekeeping role with respect to scientific testimony.

There is certainly some value to the notion of providing better resources to judges that would assist by educating them in the special issues involved with scientific testimony, suggesting effective ways of managing such testimony at trial, and perhaps introducing an element of specialization into the superior court judiciary. I discuss this further in Chapter 7, Section 6. The notion, however, that remedial science training alone would, at a stroke, remedy the difficulties associated with judicial decision-making in

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[1] See, Farrell (1994), at pp. 934-935. Our system of law, at least at the superior court level (the Court of Queen's Bench), favors the notion of generalist unspecialized judges. The Alberta Provincial Court does have specific divisions (e.g. Youth Division, Family Division) and the judges assigned to such a division will generally sit only on matters pertaining to that division. In this way, it is thought, we obtain judges with a degree of specialization within a particular area of law. There is presently debate within the legal community in Alberta over the appropriateness of the 'generalist' approach.

[2] See, for example, Fienberg and Schervish (1986), at p. 795.

respect of science is pure fantasy.[3] Professional scientists go through a lengthy education and indoctrination in the language, methods, and background knowledge necessary to perform scientific inquiry. The closest that most judges will ever have come to this education is a dim recollection of their high school science and, if fortunate, some exposure to certain forms of scientific testimony in their previous practice and judicial experience. We cannot expect that "remedial science for judges" will overcome, in a short span of time, the lifetime of experience that professional scientists possess. Neither can we expect that such training would be sufficient to provide judicial scientific competence across the many disciplines that could be encountered in the courtroom.

Juror-Centred Responses

One could focus upon the use of lay juries as the source of the difficulty with expert testimony. In Chapter 3, I discussed the principled problem, the lack of sufficient background knowledge on the part of lay jurors to adequately assess scientific testimony, as well as some of the ways in which our adversarial form of legal inquiry can impair the use of science in the courts. The lack of sufficient lay background knowledge leads some commentators to suggest remedying the problem by attempting to secure the knowledge necessary to evaluate scientific testimony among the triers of fact. The suggestions that follow along this line, as with similar suggestions with respect to the judiciary, range from the simplistic to the radical. On the simplistic end there is the suggestion that we retain lay juries but that, where special knowledge would be an asset to their ability to

[3] I would also expect that a judiciary imbued in a legal tradition favoring the generalist conception of their role would be highly resistant to the suggestion of specialized scientific training.

evaluate testimony, we provide such jurors with remedial training. For example, concerning expert evidence expressed in statistical terms, Fienberg and Schervish recommend, "that all jurors be given some training in the basic elements of probability and the meaning of uncertainty quantification."[4] I have already noted the reasons why this approach is a fantasy in the case of inexpert generalist judges. It is no less of a fantasy when proffered in respect of lay jurors possessing even more varied educational backgrounds and cognitive abilities.

This line of reasoning could be pursued further to the more radical recommendation that we utilize expert jurors in cases involving complex scientific testimony. This might involve requiring that jurors sitting on cases involving scientific testimony possess some form of higher education (a university degree) or, more extreme still, that jurors be selected from pools of experts. Approved jury pools for specific areas of expertise could be generated, for example, with the assistance of professional bodies (universities, professional associations, trade associations, etc.). The concern that fact-finders lack the requisite background knowledge and experience to evaluate scientific testimony, it is argued, vanishes if the fact-finders are selected from among those possessing knowledge that enables them to comprehend and assess the scientific testimony that they will be exposed to. One could pose the objection that the sciences exhibit great specialization and that higher education, or expertise in one area of the sciences, does not necessarily translate into competence to evaluate testimony from an unfamiliar field. The proponent of expert juries could respond in several ways to this line of objection. Assuming a more general pool of jurors with higher education, the

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[4] Fienberg, S., and Schervish, M., (1986), at p. 795.

proponent of this approach could reply that, while lacking specific expertise, such jurors would nevertheless constitute a considerable epistemic improvement over jurors lacking this educational background. In the case of expert juror panels one could argue that such jurors would, for example, possess knowledge of the mathematical and statistical language of the sciences. They would also be familiar with the 'culture' of the scientific community and thus less prone to the various adversarial means of exploiting the myth of scientific objectivity discussed in Chapter 3.

The notion of employing expert jurors to determine the facts in cases involving complex expert testimony has appeal to the technocrats amongst us, but it is not an apt suggestion in light of the political morality that informs our legal system. Indeed, in the context of criminal trials, such a suggestion very likely attracts difficulties of a constitutional nature. The notion of factual determination by a lay jury receives its theoretical justification from two considerations. The first is that a 'jury of one's peers' should determine facts. The idea here is that legal findings of fact are expressions of the political morality that informs the legal system. As such, the jury should be representative of the community at large and not some particular segment of the community:

> [O]ne of the most important functions any jury can perform in making such a selection [a finding of fact] is to maintain a link between contemporary community values and the penal system - a link without which the determination of punishment could hardly reflect "the evolving standards of decency the progress of a maturing society."[5]

The second consideration is that the juror deliberation on the facts should be a matter of commonsense judgment. Again, this embodies the belief that the ordinary citizen,

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[5] *Witherspoon* v. *Illinois,* 391 U.S. 510 (1968), at p. 519.

possessed merely of commonsense judgment, ought to be the party that determines legal liability.

What peer judgment by ordinary citizens using commonsense really reflects is the notion that the integrity of the legal system depends upon the assent of the citizenry and, consequently, that the determinations of ordinary citizens *ought* to be the bridge between law and the communities served by the law. This is a democratic and populist rejection of the notion of trial by elites (political, bureaucratic or, presumably, intellectual) that is deeply rooted in the evolution of the common law system (see Section 6.5 below). The values of this political morality are entrenched within the legislation that governs juries within Canada. In respect of criminal proceedings, the *Criminal Code* provides that jurors are to be selected in accordance with the laws of the relevant province.[6] In Alberta, the *Jury Act* governs the qualification of jurors and sets out three requirements: (1) the juror must be a resident of Alberta; (2) the juror must be a Canadian citizen; and (3) the juror must be eighteen years of age or older.[7] The first two requirements reflect the notion of a jury of one's peers drawn from the community in general and, as citizens, possessing a tacit commitment to the laws of the state. The third requirement reflects the minimal 'cognitive threshold' for jury duty; that is, the individual must have reached sufficient maturity to exercise his or her civic duties. In the criminal context, the values underlying our jury system are more deeply entrenched, finding expression within section 11(f) of the *Charter of Rights and Freedoms*.[8] The notion of expert jurors is antithetical to these

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[6] *Criminal Code*, R.S.C., c. C-34, s. 626 (1).

[7] *Jury Act*, R.S.A. 2000, c. J-3, s. 3.

[8] *Canadian Charter of Rights and Freedoms*, s. 11(f). The section reads: "Any person charged with an offence has the right, (f) except in the case of an offence under military law tried before a military tribunal,

expressions of our political morality. In terms of criminal liability, the notion is so adverse that any move to require expert juror panels in respect of cases involving complex expert testimony would attract adverse and possibly insurmountable constitutional scrutiny.

One could argue that the notion that the institution of the jury legitimizes the trial process is questionable, noting that, at least in Canada, jury trials are relatively rare. I am doubtful, however, that this fact poses any substantive challenge to the underlying rationale. The principal reason for the rarity of trials, jury *or* judge alone, rests with the fact that matters are frequently settled out of court in civil actions, or pleaded out in criminal actions. In both instances there are usually reasons that render it pragmatic for the parties to avoid the trial process (time, cost, incentives for pleading guilty, etc.). The fact that parties can have good reasons to avoid the trial process does not, however, negate their right to pursue the matter to trial and is irrelevant to the question of what should legitimize the *trial process*. That is, the question of what legitimizes a trial, and what legitimizes the resolution of disputes in a legal system as a whole, are two distinct questions.[9] Nor does the fact that more matters in Canada are resolved by judge alone pose a challenge to the underlying political rationale. The *Charter of Rights and Freedoms* guarantees a party's right to a jury trial where the maximum punishment for an offence is imprisonment for five years or a more severe punishment.[10] Once again, there

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to the benefit of trial by jury where the maximum punishment for the offence is imprisonment for five years or a more severe punishment."

[9] The latter encompasses the former but also includes all of the various ways (negotiation, settlement, etc.) that a system can resolve disputes.

[10] *Canadian Charter of Rights and Freedoms*, s. 11(f). In civil matters, the circumstances under which a litigant has a right to a jury trial are specified by the respective provincial legislation governing juries. In Alberta, a litigant has a *prima facie* right to a jury trial if the matter falls within the grounds set out by

are often pragmatic reasons why parties elect to proceed by judge alone.[11] The fact that a party waives his or her right to a jury, e.g. under s. 536(2) of the *Criminal Code*, does not negate the underlying rationale since the presumption remains that of a jury trial unless the defendant expressly elects otherwise and thereby consents to the legitimacy of a trial by judge alone.

6.2 Non Adversarial Alternatives: The Rationale

Many commentators find the concerns that I expressed with a pure inclusionary approach toward scientific testimony, or some combination of these concerns, to be persuasive against such an approach. Dissatisfaction with the use of scientific testimony in our courts often settles, however, on the ways in which the adversarial context of the inquiry can, given the inexpertise of the trier of fact, "abuse" the science presented in court - either by creating the appearance of unreliability where there is none, or by obscuring unreliability.[12] The traditional means of addressing evidential concerns, through the use of rules of evidence such as those I canvassed in Chapters 4 and 5, leaves the use of science open to many of these concerns about the adversarial abuse of scientific testimony. This concern, combined with the notorious difficulties associated with formulating a principled and efficient exclusionary rule for dealing with scientific testimony, leads some commentators to suggest more radical procedural departures.

Section 17(1) of the *Jury Act*; the onus is upon the party opposing a jury trial to show why a jury is inappropriate, *Knight et al.* v. *Goodfellow* (1979), 11 Alta. L.R. (2d) 191 (C.A.). Section 17(2)(b) of the Alberta *Jury Act* provides an exception to this that is applicable to the instance where scientific testimony is involved. In these instances a judge may direct that the action proceed by judge alone; see also, *Robinson Estate et al.* v. *Doolittle Estate* (1988), 90 A.R. 376 (C.A.).

[11] See, for example, *R.* v. *Turpin* (1989), 69 C.R. (3d) 97 (S.C.C.).

[12] See my Chapter 3, Section 4.

One of the more popular proposals for dealing with scientific testimony, at least with commentators, is to recommend the introduction of non-adversarial mechanisms into our system. The rationale remains the same as we find with a more traditional exclusionary approach. Since triers of fact cannot be expected to possess the background knowledge necessary to evaluate scientific opinion, unreliable science must be excluded from their consideration. Citing the problems that can arise when the parties to the proceeding control the presentation of scientific testimony at trial, proponents of the non-adversarial approach recommend removing, to a greater or lesser extent, party control over the science at trial. Non-adversarial approaches typically seek to attain exclusionary ends by restricting, in an extra-legal manner, those who may provide scientific testimony. That is, the determination of who may offer scientific testimony does not rest with the parties, or with the determination of a judge, but rather with some non-legal body that is capable of rendering judgments concerning reliable science. This also removes the adversarial challenge constituted by the presentation of contrary witnesses - the so-called "battle of the experts" problem - since the trier of fact will only hear one scientific opinion at trial. Approaches of this sort may go farther still and limit the scope of the challenge that lawyers may offer in their examination of such non-adversarial witnesses. In the following two sections of this chapter I will examine how one continental system approaches scientific testimony and a proposal for incorporating some of the non-adversarial features of this system into our own adversarial system.

6.3 Non-Adversarial Alternatives: Langbein

The non-adversarial approach is perhaps exemplified by the civil law tradition that we find among the nations of continental Europe. John Langbein's article "The German Advantage in Civil Procedure" presents a comparison between the civil procedure typical of common law systems and that of the, as it then was, West German state.[13] This article has received considerable attention among legal and non-legal scholars,[14] for one of Langbein's contentions is that German civil procedure does a much better job with scientific testimony, both in terms of case management and in epistemic terms, than our own adversarial system. Langbein's complaint with the common law treatment of expertise, not surprisingly, focuses upon the partisan control over the selection and presentation of the expert witness. His chief concerns rest with the possibility of factual distortion arising from paid partisan experts ('hired guns'), juror confusion arising from the conflict of partisan expert opinion ('the battle of experts'), and the potential for adversarial questioning to all too easily undermine the credibility of partisan expert testimony.[15] The substance of these complaints need not detain us. There is a legitimate basis for raising these concerns as has been argued in the preceding chapters of this work. Let's look briefly, then, at the non-adversarial German model as it is presented by Langbein.

The continental tradition of legal inquiry, represented in Langbein's piece by the German legal system, is best distinguished from our own adversarial tradition in that the

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[13] Langbein, J., (1985). I offer no claims as to the present state of German civil procedure; since my interest here is theoretical, Langbein's snapshot of the civil law tradition suffices.

court, in the person of a magistrate or judge, plays the active role in driving the inquiry rather than the parties to the proceeding. This is no different in the case of expert testimony; if the investigating judge determines that expertise would assist in resolving the case then the court, on its own motion, will seek out an expert.[16] Parties may request that an expert be brought into the proceeding, and courts may receive nominations of experts from the parties to the proceeding, but the practice is generally for the court to make the decision to seek out expertise.[17] The actual selection of the expert is within the discretion of the investigating judge, however, judges are provided with extensive lists of experts organized by specialty and sub-specialty, prepared by professional bodies and, in the case of commercial and technical fields, by quasi-public bodies empowered by state governments to assemble such lists.[18] The removal of party control over the selection of the expert, as well as the fact that the court will generally only seek out a single non-partisan expert opinion on a given issue, avoids the confrontation of opposing expert opinion that is characteristic of our own adversarial tradition. Proponents of the continental approach, such as Langbein, contend that this makes for a much more impartial application of expertise to the inquiry. Since the selection of the expert is made

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[14] For example: Luban (1988), Goldman (1999). Luban discusses Langbein's piece in the course of his evaluation of merits of the adversarial system; Goldman invokes Langbein's analysis in the specific context of courtroom expert testimony.

[15] Langbein (1985), at pp. 835-836.

[16] *Ibid.*, at p. 837. Courts in our system typically may, either on their own motion or that of a party, appoint an independent expert. See, for example, Rule 218 of the Alberta Rules of Court. The use of independent experts, under procedures comparable to Rule 218, is rarely employed in our system and we should note that the procedure is meant to supplement, not supplant, the partisan system. The continental system could be characterized as the opposite of this: partisan experts, to the extent that they play a role in the continental system, supplement that of the independent expert.

[17] *Ibid.* The only instance where the court would be obliged, however, to adopt a party nominated expert is where the selected expert has been agreed upon by all parties to the proceeding.

from approved extra-legal lists, the approach represents a deferential approach to reliability. The opinion will be as reliable as the methods that govern the area of expertise from which the expert is drawn.

The non-adversarial nature of the continental system's approach to expertise extends well beyond the mere selection of the court-appointed expert. In the German system of civil procedure that Langbein describes, it is the court that instructs the expert, "in the sense of propounding the facts that he is to assume or to investigate, and in framing the questions that the court wishes the expert to address."[19] Once again, the parties to the case may make submissions as to what instructions the investigating judge will give to the expert.[20] The outcome of this procedure is ordinarily a written report by the expert that is then circulated to the parties. Both the court and the parties may, at this time, request that the expert reply to questions arising from the report. The parties are not entirely at the mercy of the court appointed expert; a judge possesses the discretion to order a further report by another expert if the first is deemed unsatisfactory. Parties may make pleas for the exercise of this discretion and may retain their own experts to establish grounds for persuading the court to commission a further report.[21] The contrast to our own party driven procedure cannot be starker. By restricting party input concerning the questions put to the expert, as well as the ability of parties to challenge the independent expert with their own partisan experts, the continental system eliminates at a stroke the

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[18] *Ibid.*, at pp. 837-838. In selecting the expert from these lists, Langbein notes that, "the most important factor predisposing a judge to select an expert is favorable experience with that expert in an earlier case." *Ibid.*, at p. 838.

[19] *Ibid.*, at p. 839.

[20] *Ibid.*

dynamics discussed in Chapter 3 with respect to the impact of adversarial questioning before a lay jury. Langbein contends that the system "strikes an adroit balance" in which, "[e]xpertise is kept impartial, but litigants are protected against error or caprice through a variety of opportunities for consultation, confrontation, and rebuttal."[22]

The German civil procedure, discussed by Langbein, that is representative of continental systems of law, is very different from our own system of legal inquiry. The Continental form of inquiry is structured as a kind of investigation guided by a magistrate rather than the witness focused contest of advocates that we find in our adversarial tradition. It is sheer fantasy to contend, for the foreseeable future, that our legal system could entirely abandon the adversarial model of inquiry for the form of inquiry described by Langbein. Those impressed by the "adroit balance" described by Langbein in respect of this system's treatment of expertise do, nevertheless, contend that significant non-adversarial features of this system could be introduced within our system of law to lessen the excesses of the adversarial interplay with science and improve the use of expertise in our courts. In the next section I will consider one such proposal for incorporating features of the continental model into our own system and evaluate its epistemic merits.

6.4 Non-Adversarial Alternatives: Goldman's Proposal

The issue posed by scientific testimony in the courts receives attention in Alvin Goldman's *Knowledge in a Social World*. In this work's comparative discussion of

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[21] *Ibid.*, at pp. 839-840. In this case the court does not directly take the party expert's opinion to be a rebuttal of the court engaged expert; rather, the court takes the party expert's opinion into account as a basis for seeking further independent advice.

[22] *Ibid.*, at p. 40.

common law and civil law traditions Goldman draws upon Langbein's influential article,[23] discussed in the preceding section, and incorporates aspects of the continental tradition into his recommendation. To begin, I should note that there are many ways in which Goldman and I concur. Both of us, as a general matter, would endorse a reliabilist account of testimonial justification.[24] We both share the view that legal inquiry is veritistic, the system is truth-seeking, and "fundamentally" so.[25] Both of us also recognize a problem with expert testimony in the context of legal inquiry, for many of the same reasons, and consequently both of us endorse the need for an alternative to what I characterize as a purely inclusionary approach to scientific testimony. Finally, Goldman rejects the current exclusionary approach within U.S. Federal law represented by the *Daubert* decision - once again, for many of the same reasons that I articulated in Chapter 4.[26] Where we part company, however, is on the matter of the legal technology that is appropriate to improving the treatment of scientific testimony within the adversarial tradition of law. Goldman rejects the viability of an exclusionary approach and instead advocates a procedure with significant non-adversarial features to accomplish many of the same ends sought by the more traditional legal approach.[27] In this section I will articulate the procedure that Goldman envisions. Many of the same criteria set out in

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[23] Goldman (1999), at p. 290.

[24] *Ibid.*, at pp. 129-130.

[25] *Ibid.*, at p. 279 and 284. Goldman cites Rule 102 of the U.S. Federal Court Rules in support of his contention that truth seeking is one of the "core objectives" of legal inquiry. The rule states that, "These rules shall be construed to secure fairness in administration, elimination of unjustifiable expense and delay, and promotion of growth and development of the law of evidence to the end that the truth may be ascertained and proceedings justly determined." As I argued in Chapter 1, truth seeking is a necessary condition of justice.

[26] *Ibid.*, at pp. 306-309.

[27] I suspect that some of the motivation for Goldman's approach derives from his sympathies (or infatuation?) for the veritistic merits of the inquisitorial model of legal inquiry - see *ibid* at pp. 289-292.

Chapter 4 for evaluating exclusionary approaches are equally useful in assessing non-adversarial routes to the same ends, so I will utilize these criteria to render an assessment of Goldman's suggested procedure.

What is wrong with the traditional exclusionary approach that would motivate a more exotic procedure? In Chapters 4 and 5, I reviewed many exclusionary tests aimed at screening out injurious scientific testimony and argued that all of them pose difficulties from either a principled standpoint, an efficiency standpoint, or both. There is little doubt that the task of formulating an adequate exclusionary rule is a difficult one and this, in part, seems to motivate Goldman's disenchantment with this approach:

> Exclusion of testimony, however, is a fairly drastic step, which should not be taken lightly. It calls for clear and precise criteria of exclusion, which are extremely difficult to formulate, as the *Daubert* opinion itself illustrates. The necessity for such criteria can happily be circumvented if courts do not make decisions about which testimony is "sufficiently" scientific.[28]

This passage reflects the epistemic principle underlying an inclusionary approach: the requirement of total evidence. Generally one should consider as much of the relevant evidence as is practicable when seeking the truth; all the more so given the consequences that attach to such findings of fact in the legal context. That is why the exclusion of testimony is a "drastic step." The argument seems to be that, unless the exclusionary test is both one that can be implemented by a trier of law and capable of principled distinctions, the "cure" is worse than the ailment. Goldman's alternative therefore seeks to obviate the need for an exclusionary rule.

The reform that Goldman favors is to introduce into the adversarial system the practice, found within inquisitorial legal systems, of utilizing independent court-

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[28] *Ibid.*, at pp. 310-311.

appointed scientific experts. He does not suggest replacing partisan experts entirely. The testimony of party experts would be admissible, "to introduce results of tests they themselves conducted."[29] The partisan experts would not be permitted, however, to testify as to the scientific interpretation of any such tests or to the reliability of this testing.[30] This would be the sole preserve of the independent court-appointed expert. Presumably these independent experts would also be entitled to rely upon their own testing and background scientific knowledge and not simply the results of testing conducted by the parties. Goldman advises that independent experts should be drawn from "a professionally approved list of candidates," and would be assigned to cases, as with trial judges, by random selection.[31]

The procedure that emerges appears to integrate aspects of the traditional adversarial system with features of continental approach in an attempt to secure some of the same benefits, described by Langbein, of that tradition. The decision to introduce scientific testimony into the inquiry would remain with the parties but the testimony of party experts would contribute only to the observational data underlying the final independent interpretation presented at trial. Thus, as with the continental model, only one 'authoritative' scientific interpretation would be before the court through the medium of a non-partisan witness; party experts would play a supplementary role rather than the primary role. The independent expert would also be a witness, and therefore subject to the challenge of cross-examination by the parties. The parties, however, would be unable to challenge the evidence of the independent expert by presenting contrary interpretations of

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[29] *Ibid.*, at pp. 309-310.
[30] *Ibid.*, at p. 310.

the science through their own expert witnesses and it is uncertain as to how much latitude party lawyers would have to raise contrary scientific interpretations within their questioning of the independent expert. This proposal also represents the same deferential approach to the scientific community that we find in the continental model since, unlike an exclusionary approach where the trier of law must himself make a determination of reliability, the *de facto* exclusion of scientific testimony occurs extra-legally with the professional bodies selecting the independent expert prior to the trial process. The reliability of the scientific interpretation, Goldman contends, is ensured insofar as the mechanisms of the professional scientific community are themselves capable of ensuring reliability.

Let us consider, then, how well Goldman's proposal would make out under the principled and efficiency criteria articulated in Chapter 4. A principled exclusionary approach is one that, so far as is practicable, will ensure the exclusion of unreliable scientific testimony from presentation before a trier of fact, while permitting the inclusion of reliable scientific testimony. While Goldman's proposal seeks to circumvent the difficult problems associated with formulating a judge-applied exclusionary test, it nevertheless seeks the same end as an exclusionary test. The exclusion of testimony is achieved procedurally through the requirement that only independent court-appointed experts will testify as to the scientific interpretation of tests or data presented by party witnesses. Does this approach, then, hold much prospect for principled exclusions of unreliable scientific testimony? Provided that the methods employed by the relevant scientific community are in fact reliable, and provided that the community exhibits

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[31] *Ibid.*, at pp. 310-311.

substantial professional homogeneity, there is good reason to suppose that this approach would result in the principled presentation of scientific evidence at trial. "Fringe" science or novel scientific claims that have not yet undergone sufficient professional scrutiny would not enter the courtroom as the court-appointed expert, beholden to no party, would only present the interpretation of the data that his field could be said to support.

There are, however, several potential difficulties with this proposal that concern its ability to render principled uses of scientific testimony at trial. Experts under this proposal would be randomly selected from lists of experts prepared by the relevant professional associations and the court would play no role in assessing the reliability of the selected expert's testimony. The implicit assumption behind this deference to professional bodies is that the methods employed by their members will be reliable and that the extra-legal bodies themselves are best positioned to determine whether their members meet the relevant standards of reliability applicable to the field of expertise. To begin with, this deference assumes that all fields of scientific inquiry employ reliable inquiry methods. While this is probably true in most fields that have claim to "scientific status" the view, nevertheless, represents some element of wishful thinking. The various social sciences provide one of the most significant sources for the contemporary courtroom use of expert evidence yet, in many cases, the procedures of hypothesis generation that are employed, such as factor analysis and regression, are done so with virtually no attention to the conditions for their reliable use.[32] There are comparable concerns with many techniques employed by forensic science[33] - another field with

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[32] Glymour (1998), at p. 2.
[33] See, for example, Jonakait (1994).

commonplace court application. If the methods employed by the field from which the independent expert are drawn are themselves unreliable it presents scant consolation, from an epistemic point of view, that they are testified to by a non-partisan independent witness.

A further principled objection arises from the deferential approach to expert selection employed by Goldman. His approach assumes greater professional homogeneity than is sometimes the case. The scientific community certainly does possess social mechanisms, such as the system of peer review and publication and the system of recognition, that tend to promote homogeneity.[34] We may also observe, nevertheless, that the history of science is littered with examples of internal debate between rival research traditions within the same field of expertise. Internal debates arising from competing research traditions account for scientific change in Kuhn's analysis of science and Laudan notes that the normal practice of science is often attended by competing traditions co-existing at the same time.[35] Selecting an independent expert from an established extra-legally determined list may therefore inadvertently result in the suppression of legitimate and reliable testimony in cases where the field itself exhibits fractured opinion.

In presenting the preceding two objections to the principled quality of Goldman's proposal I have, perhaps, made the case more strongly than it needs to be. When describing Goldman's proposal itself, I noted that it is not entirely clear what the scope for the partisan cross-examination of the expert witness would be under this approach. Restricting the testimony by the partisan experts seems to suggest that Goldman has in

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[34] See, for example, Kuhn (1970), chapters 3 and 4; and Barnes (1985).
[35] Kuhn (1970) and Laudan (1977).

mind a relatively narrow scope. One can, however, envision a wider scope for cross-examination of the independent expert. Provided that the party advocates have done their 'homework,' or are well-advised by their own experts, one can envision questioning that aims to elicit testimony on cross that exposes weaknesses stemming from accepted but questionably reliable methods, or fractured opinion within the relevant scientific community. Indeed, as was discussed in Chapter 3, this sort of questioning is very much a feature of current techniques for approaching the scientific witness.[36] One could also envision a potential role for rebuttal expert witnesses called by the parties - for example, in those instances where the relevant scientific community is significantly fractured. There is a delicate balance to be struck here between avoiding, as Goldman seems to prioritize, a partisan 'battle of experts,' and providing the legal machinery to deal with shortcomings that arise from the deference this approach displays to the scientific community. There is reason, however, to believe that the principled objections associated with this proposal are not serious enough to warrant its rejection.

How does this non-adversarial approach stack up under the efficiency criteria articulated in Chapter 4? Goldman's proposal does provide an efficient means of handling scientific testimony in many respects. The pecuniary costs of employing independent experts in the manner envisioned may place an additional financial burden on the court process but it is also likely that many actions would be discouraged by the uncertain prospect of securing independent testimony that is as favorable as when partisan experts opinions are employed. The court time spent on expert testimony, and the costs associated with this, might actually be reduced as only the independent expert is

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[36] See, for example, Imwinkelreid (1997).

permitted to offer an opinion as to the scientific interpretation of data and observations presented to the court. Because the proposal is deferential to the scientific community itself, there are not the usual concerns associated with the ability of a trier of law to efficiently utilize the procedure. The trier of law does not even enter the process as in the case of an exclusionary rule of evidence designed to deal with scientific opinion evidence. Thus, in terms of the ability of the court system to easily employ Goldman's procedure, and in terms of the potential pecuniary and temporal costs, the proposal does hold promise as an efficient piece of legal technology.

There is one concern from the standpoint of efficiency that readily springs to mind when considering the potential utilization of Goldman's procedure. This concern stems from a well-known insight within the philosophy of science about theory and observation. The procedure envisions that only the independent court expert, and not the partisan party experts, is permitted to testify as to scientific interpretation; the party experts are limited in the scope of their testimony to reporting tests that they have conducted and other observational results. This, however, supposes a clearer line between observation and scientific interpretation than is perhaps the case. In my Chapter 3 discussion of the use of statistical evidence, and in my Chapter 5 discussion of Limpert's uncertainty based model, we have already seen various instances where what is observed within scientific inquiry is not easily disentangled from the methods employed and the theories informing the inquiry. One may note, in reply to this objection, that this sort of problem is endemic to scientific inquiry. Consequently, no procedure could reasonably be expected to disengage all interpretation from the presentation of observational results. If we interpret

Goldman's proposal less strictly, for example, as restricting partisan experts from drawing scientific conclusions, this objection is easily dissolved.

I have argued that Goldman's non-adversarial procedure is still subject to objections from both principled and efficiency standpoints. One might suggest that these objections are, on balance, less formidable than the objections posed in respect of the inclusionary and exclusionary alternatives; that a procedure of this sort represents something of the lesser of competing evils. In terms of case management the procedure represents a much less complicated, more efficient, approach to scientific testimony. Compared to the difficulties associated with formulating a practicable, judge applied, exclusionary rule the efficiency-based objection just canvassed is far less significant. The principled objections to this approach are rooted, as with the proposal itself, within the scientific community. I noted the possibility that these objections could be mitigated by according a greater role to the adversaries than Goldman would appear to endorse. One could also reply, in Goldman's defence, that we should repose far greater confidence in the scientific community itself to deal with these considerations, rather than a trial judge who likely lacks any of the expertise required making a determination of scientific reliability.

So where do we stand at this stage of the analysis of the non-adversarial approach? In Chapter 2, I articulated a contextualized account of testimonial justification whereby the nature of the justification required for testimonial knowledge, externalist or internalist, will vary depending on the inquirer's underlying veritistic motivations (for example, error avoidance and maximization of true beliefs). In Chapter 3, I argued that the legal context prioritizes error avoidance and therefore demands that legal fact-finders

possess internal justification - justifying reasons - for the factual determinations they make. This engaged the fundamental problem of this work: how can non-expert legal fact-finders be expected to possess this form of justification in respect of expert opinions that they lack the requisite knowledge to adequately assess for themselves? Goldman's non-adversarial approach, much like the exclusionary approaches examined in Chapter 4, seeks to mitigate this epistemic shortcoming by ensuring that the science that does come before a legal fact-finder is reliable. Unlike the more traditional exclusionary approach, the non-adversarial response short-circuits the difficulties associated with formulating such a rule by deferring to the scientific community itself. To the extent that the scientific community itself employs reliable methods, we can conclude that Goldman's proposal does represent an improvement, as an epistemically principled response, over the other candidate responses discussed thus far. The proposal constitutes a relatively efficient legal response (timely, cost effective, and no complicated scientific analysis required by the trial judge). Finally, through the more severe restrictions placed upon the involvement of partisan experts, the approach arguably lessens the difficulties, discussed in Chapter 3, associated from competing expert opinion - difficulties that the more traditional exclusionary approach does not necessarily address. While I am prepared to concede the epistemic benefits of Goldman's non-adversarial approach I nevertheless would resist endorsing this as a desirable response, particularly in the context of the criminal law and, arguably, in the civil context as well. From the outset of this work I have argued that epistemic ends are integral to a justice system. They are not, however, the only ends that a justice system must serve. To understand why I resist endorsing a non-adversarial response to the problem of scientific testimony we must, therefore, divert

to an examination of the difficulties that the political and moral ends of our legal system pose to Goldman's proposal and, more generally, to the political morality that underwrites our adversarial system.

6.5 What is Wrong With Radical Alternatives?

While there is an argument for the epistemic benefits of Goldman's non-adversarial proposal there are, nevertheless, significant challenges that arise for this sort of response once we factor in the non-epistemic ends of our justice system. In a sense, these challenges raise a special sort of efficiency consideration. A radical non-adversarial proposal implicates costs beyond time, monetary and cognitive costs, since by altering our legal technology in a fundamental way it raises a host of difficulties associated with integrating the proposal within our legal system. We may therefore characterize this sort of cost as a systemic cost since it implicates fundamental features of our legal system. There are two such systemic costs that I will discuss with respect to Goldman's non-adversarial proposal. The first, and greatest difficulty is that the proposal engages constitutional difficulties in the context of criminal law. This is of particular significance in the Canadian context since the preponderance of Canadian cases raising issues concerning expert scientific testimony emerge from criminal prosecutions. The second difficulty is a broader one, encompassing civil contexts as well, that engages the political and moral values of the adversarial system.

There are two constitutional concerns that I wish to raise concerning Goldman's non-adversarial proposal. To begin with, in our system of law defendants facing criminal liability possess a fundamental right to what is called full answer and defence. This

fundamental value is recognized at common law, within the *Criminal Code,* and found to be a constitutional right under sections 7 and 11(d) of the *Canadian Charter of Rights and Freedoms.*[37] This includes the individual's right to defend himself against all of the state's efforts to achieve a conviction,[38] to confront the witnesses against him, both in cross-examination and through the presentation of witnesses to challenge the evidence against him.[39] Restricting expert testimony on the scientific interpretation of fact to independent court-appointed experts appears to run afoul of this fundamental right. This would also be the case if, as it seems it does, the proposal restricts the scope of the cross-examination with respect to the independent expert's scientific interpretation.

The second constitutional concern that I wish to raise is less obvious than the first. Recall that, under Goldman's proposal, it is an extra-legal body, such as a professional association, that selects the list of independent experts from which the only scientific interpretation at trial will be adduced. This procedure can therefore have the effect of a rule of admissibility; that is, it excludes potential testimony from partisan (defence) experts. The determination of the admissibility of evidence, however, is *a legal determination* in the province of a trier of law. Section 7 and section 11(d) of the Charter envision that a defendant has a right to a fair hearing before an impartial tribunal and the right not to be deprived of section 7 guarantees "except in accordance with the principles of fundamental justice." Circumventing a judicial determination of the admissibility of

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[37] *R.* v. *Delisle* (1999), 133 C.C.C. (3rd) 541 (Que. C.A.). See also the *Criminal Code,* R.S.C., c. C-34, s. 650(3). Section 7 of the *Charter* provides that, "Everyone has the right to life, liberty and security of the person and the right not to be deprived thereof except in accordance with the principles of fundamental justice." Section 11(d) of the *Charter* holds that, "Any person charged with an offence has the right to be presumed innocent until proven guilty according to law in a fair and public hearing by an independent and impartial tribunal."

[38] *R.* v. *Rose* (1998), 129 C.C.C. (3d) 449 (S.C.C.).

defence evidence arguably violates these *Charter* rights since the determination of the admissibility of evidence is usurped by an extra-legal body that is not bound by the principles of fundamental justice and does not hear the submissions of the defendent.

There are three responses available to the proponent of non-adversarial procedures for dealing with scientific testimony in the criminal context. First, one could argue that the envisioned non-adversarial procedures do not actually constitute violations of rights guaranteed under the *Charter*. Assuming that this argument is unsuccessful one could recommend a constitutional change that would accommodate the introduction of non-adversarial features into our system of law. This is a highly improbable suggestion given both the weight of the problem and the notorious record of effecting Constitutional change in Canada. Finally, again assuming that the proposal runs afoul of the *Charter*, one could argue that the proposal is justifiable under Section 1 of the *Charter*. I will begin by examining the first of these arguments and then proceed to briefly consider the prospects for the proposal under a Section 1 analysis.

The 'best case scenario' for the application of Goldman's non-adversarial proposal to the criminal law would be to find that it does not actually infringe any *Charter* rights. One possibility that provides some purchase against the full answer and defence objection proceeds from the nature of the evidence. Assuming that the expert testimony the defence seeks to introduce is epistemically prejudicial one could note that no constitutional right is infringed since the right of full answer and defence does not equate to a right to introduce highly prejudicial or irrelevant testimony.[40] The purchase

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[39] *R.* v. *Delisle*; see also *R.* v. *Simmons,* [1923] 3 W.W.R. 749 (B.C.C.A.).
[40] *R.* v. *Darrach* (2001), 148 C.C.C. (3d) 97 (S.C.C.), at pp. 116-120.

gained here, however, erodes under the very assumption it makes. Under Goldman's proposal there is no determination of the potential prejudicial effect of the defence evidence. Partisan expert testimony on matters of scientific interpretation is simply excluded *without any inquiry into its merits whatsoever.* This point also underscores the related second constitutional objection cited above: that the envisioned non-adversarial approach usurps the legal role of the trier of law in determining the admissibility of evidence.

The only other avenue through which such a fundamental change could survive constitutional challenge would be for such a procedure to be justified under Section 1 of the *Charter.* This provides for limits upon *Charter* rights that "can be demonstrably justified in a free and democratic society."[41] The Section 1 analysis set out in the *Oakes* test requires, however, that the objective be of "pressing and substantial concern," and that there be "proportionality" in the sense that the means are rationally connected to the objective, impair guaranteed rights as little as possible, and that there be proportionality between the effects of the measures taken and the objective.[42] Assuming that one is sufficiently persuaded that there are pressing and substantial concerns posed by scientific testimony within our system of legal inquiry, it nevertheless is highly doubtful that a procedure such as Goldman's would survive the proportionality element of the *Oakes* test for the simple reason that there are alternative legal procedures (e.g. exclusionary rules of evidence designed to screen out unreliable evidence) that would do so without impeding upon constitutionally protected rights. Given the foregoing constitutional arguments, I

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[41] *Canadian Charter of Rights and Freedoms,* s. 1.
[42] *R.* v. *Oakes* (1986), 24 C.C.C. (3rd) 321 (S.C.C.).

conclude that there is little prospect for introducing non-adversarial procedures into Canadian criminal law.

Constitutionally protected individual rights in Canada exist in relation to state-individual interactions or in relation to private interests.[43] Consequently, the same constitutional concerns expressed with respect to the criminal law do not extend to interactions between individuals or private interests. In the civil context of legal inquiry there is therefore greater latitute for the implementation of case management procedures that, so long as they meet basic standards of fairness, depart from the aspects of adversarial justice that are constitutionally entrenched.[44] If we restrict Goldman's non-adversarial proposal to the civil context, thereby avoiding the difficulties that would attach to this as a general evidential procedure, there is much more to be said in its favor. This move would leave us seeking a different sort of response in respect of criminal procedure, the more vital venue for the Canadian context. One could argue, however, that we should seize our epistemic gains where they are to be had. This is a conclusion that I resist; in order for us to see why, we must broaden the scope of the analysis to investigate the justification of the adversary system itself.

I have thus far relied upon constitutionally situated arguments to reject the more radical non-adversarial proposal for handling scientific evidence in the context of the criminal law. In terms of the civil law there is a much better case to be made out for

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[43] The Charter may apply in respect of private interests if there is sufficient governmental connection between a private body and the executive and administrative branches of government; see *R.W.D.S.U., Local 580 et al.* v. *Dolphin Delivery Ltd. et al.* [1986] 2 S.C.R. 573, and *McKinney* v. *University of Guelph* [1990] 3 S.C.R. 229.

[44] It should be noted that, although the *Charter* does not generally apply to private interests, the Supreme Court of Canada has favorably expressed the notion that principles of the common law should be developed in a manner consistent with the values of the *Charter*; see, *Dolphin Delivery, supra.*

incorporating non-adversarial procedures in the manner that Goldman suggests. The argument against incorporating non-adversarial mechanics into our civil law involves us in a justification of our adversarial system and this in turn parallels an even wider inquiry: perhaps a more radical re-shaping of our legal system is in order. The latter inquiry is what Goldman characterizes as a global evaluation of the epistemic merits of a legal system. Such an evaluation could proceed by comparing the epistemic merits of differing forms of legal inquiry (for example, the continental model, discussed in Section 6.3, as compared to our own adversarial model). Assuming that such an analysis reveals that there are epistemic advantages to be gained from a form of legal technology different from our own, why should we hesitate to recommend a more radical reshaping of our legal system? To provide an answer to this question involves a general defence of our adversarial system and this is a matter that extends well beyond the scope of the present inquiry. In lieu of such a full defence I shall instead confine my comments to an outline of the justification that I find compelling and leave this as a factor that tends against the introduction of these non-adversarial procedures into civil law.

Legal systems do not evolve in a vacuum. They implicate a particular history and the balancing of values achieved by a people throughout that history. Our own legal history is no different. E.P. Thompson elegantly and succinctly expresses the history and values that characterized the evolution of the rule of law within the English tradition of jurisprudence. He writes,

> [T]he rule of law itself, the imposing of effective inhibitions upon power and defence of the citizen from power's all-intrusive claims, seems to me to be an unqualified human good. To deny or belittle this good is, in this dangerous century when the resources and pretensions of power continue to enlarge, a desperate error of intellectual abstraction. More than this, it is a self-fulfilling error, which encourages us to give up the struggle against bad laws and class-bound procedures, to disarm ourselves before power. It is to

> throw away a whole inheritance of struggle about law, and within the forms of law, whose continuity can never be fractured without bringing men and women into immediate danger.[45]

The inheritance that Thompson notes has deep roots. *Magna Carta* for example, the thirteenth century concession by the sovereign of rights to the English barons, has been called the cornerstone of English liberties. The sense in which this document rightly has this 'cornerstone' claim is insofar as it established the pattern for the evolution of the notion of the rule of law within the Anglo tradition. The document would be appealed to in later centuries as a demonstration of a long-standing tradition holding that the exercise of sovereign power is limited by rights. The manner in which this constraint was achieved, through the form of law, would be taken up in turn by ever-widening segments of English society. Our legal history has embodied a balancing of values that prizes liberty and consequent restrictions upon sovereign or state authority.

Luban, an outspoken critic of the more commonplace justifications of the Anglo-American adversary system, nevertheless regards our system as justified. He offers what he characterizes as a "pragmatic justification" of the adversary system. That is, the adversary system is justified insofar as: (1) none of the alternatives are demonstrably better and some are demonstrably worse; (2) some form of dispute resolution is necessary; and (3) the adversary system is the way that we accomplish this.[46] While the continental model may yield some epistemic gains in some circumstances it nevertheless places far greater trust in the authority of officialdom than is the case with the particular

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[45] Thompson, E.P., (1975), at p. 266.
[46] Luban, D., (1988), at p. 92.

balancing of values achieved throughout the history of Anglo-American jurisprudence.[47] Abandoning core elements of our system would therefore entail a loss in respect of other values (liberty, populism, having one's 'day in court' in the manner that one chooses) that our system places greater emphasis upon. Given that the alternative is not, as a whole, demonstrably better, Luban suggests that the change would be one of trade-offs rather than "clear-cut improvements." Since radical change would involve considerable effort and dislocation the absence of clear-cut improvement renders change impractical.

I concur in large measure with Luban's pragmatic analysis. I hasten to add, however, that the point is not simply a pragmatic one as Luban suggests. The adversarial tradition, I argued, evolved in response to a historical context that valued liberty and sought to constrain the exercise of governmental authority. Let us assume that these values are themselves justifiable from the standpoint of our political morality and that our legal technology does indeed further and protect these values. If this is the case, then an argument can be made out for our own adversarial balancing of values on moral and political grounds as well as the merely pragmatic grounds suggested by Luban's argument.

The sort departure from the adversarial model of legal inquiry envisioned by Goldman in *Knowledge in a Social World* is, I conclude, far too radical for serious consideration as a response to the difficulties associated with scientific testimony in our courts. It encounters significant constitutional obstacles in the context of the criminal law.

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[47] *Ibid.*, at pp. 102-103. I do not mean to suggest that the continental model and the Anglo-American model are the only two possibilities that can be contemplated. They are, however, the two most significant legal traditions in the world today and legal communities do tend to be averse to 'reinventing the wheel.'

As a proposal for a revised civil procedure the model is more practicable; on balance it represents an improvement, both in principle and in terms of efficiency, over the other candidate responses discussed thus far. My objection to Goldman's proposal as a civil procedure therefore comes down to the justification of the adversary system: such a strong non-adversarial procedure represents too great a departure from a system that is deeply entrenched professionally, and within our political morality, for the gains envisioned. What is really needed, I contend, is an approach that remains adversarial and (more or less) unified in its approach to evidential law across both criminal and civil contexts. There are, however, useful insights that follow from this analysis of the non-adversarial approach -- insights that will inform my own suggestions in the following chapter.

When considering possible systemic changes to the Anglo-American tradition it consequently makes good sense to restrict our deliberations to initiatives stemming from this other great legal tradition.

Chapter 7 - Recommendation

How should our law handle scientific testimony? Through analysis of the epistemology of testimony I identified a principled difficulty that arises from the use of scientific testimony in legal inquiry. In Chapter 3, I argued that justice demands heightened epistemic duties on the part of legal fact-finders: they must possess adequate reasons (internalist justification) for their findings of fact. In the context of a trial we cannot expect, either through their background knowledge or through the evidence presented at trial, that legal fact-finders (a jury or a judge) will be able to evaluate scientific testimony in a manner that meets this heightened justificatory duty. It would seem that we are left with a need for an exclusionary approach to this sort of evidence that would seek to mitigate epistemic dangers by requiring that such testimony first meet some standard of admissibility.

In Chapters 4 and 5, I examined various exclusionary approaches, some existing in case law and some proposed by scholars, under both principled and efficiency based criteria. The difficulties in formulating an adequate judge applied rule of admissibility are formidable. At the conclusion of Chapter 5, after having discussed the principal difficulties associated with framing such a test, I suggested that, were this approach to be adopted, reliability based criteria of the sort identified by Brad Limpert held the best prospect for a principled response. In Chapter 6, I examined Goldman's non-adversarial proposal that is inspired by the continental practice of employing independent court-appointed experts. While I rejected his non-adversarial alternative as too radical a departure from political and moral values that underlie both the adversary system and our Constitution, I nevertheless acknowledged that there are epistemic gains attaching to the

model of deference to scientific authority represented by this approach. While we should not hasten to procedurally off-load the legal determination of admissibility upon extra-legal bodies there is an excellent case to be made for the value of interjecting scientific expertise, independent of the parties, to assist the trier of law in understanding what is required to discharge that legal determination.

In this chapter I offer a recommendation for a response to the problem of scientific testimony designed to meet the epistemic and practical needs of our law of evidence. On the basis of my analysis in the preceding six chapters I arrive at the following general conclusions concerning the nature of this response:

1. The desired response should be in the form of an exclusionary approach to scientific testimony. That is, the trial judge must exercise a 'gatekeeping' role to exclude injurious scientific testimony.

2. The desired response should involve the use of reliability-based criteria by the trial judge to assess the admissibility of potential scientific testimony. That is, the criteria employed should provide a principled epistemic response.

and finally,

3. The desired response should provide the trial judge with the means to discharge his gatekeeping role. That is, where the testimony is too complex or technical for the trial judge to evaluate unaided, court-appointed independent experts ought to be mandatory to assist the court.

My specific recommendations will attempt to incorporate these general conclusions. In this chapter I will begin by setting out a model of the procedure I envision that builds upon existing procedures in Canadian law. Next, I will describe the general nature of the proposed admissibility standard and articulate the exclusionary criteria envisioned under this standard. I will then argue that the standard fares adequately with the success

conditions for an exclusionary test as set out in Chapter 4. Finally, I will address some of the difficulties with expert testimony that remain outside of the scope of my proposal.

7.1 Procedure

In Chapter 5, I described some of the procedural suggestions offered by Limpert for handling scientific testimony. The suggestions that are of particular interest to the present discussion are those dealing with notice, expert reports, and the trier of law's assessment of admissibility. These suggestions possess merit, as well as presenting difficulties from a legal standpoint, and in this section I propose to formulate them more substantively in the context of Canadian law.[1] First, however, it will be useful to review the current rules and statutory provisions governing expert testimony.

Current Procedures

Current civil and criminal rules of procedure do speak to notice requirements to the opposing party of the intention to call expert evidence as well as a report of the substance of the testimony. In the criminal context, Section 657.3 of the *Criminal Code* concerns expert testimony. It provides that,

> 657.3 (1) In any proceedings, the evidence of a person as an expert may be given by means of a report accompanied by the affidavit or solemn declaration of the person, setting out, in particular, the qualifications of the person as an expert if
>
> (a) the court recognizes that person as an expert; and
>
> (b) the party intending to produce the report in evidence has, before the proceeding, given to the other party a copy of the affidavit or solemn declaration and the report and reasonable notice of the intention to produce it in evidence.
>
> (2) Notwithstanding subsection (1), the court may require the person who appears to have signed an affidavit or solemn declaration referred to in that subsection to appear before it for examination or cross-examination in respect of the issue of proof of any of the statements contained in the affidavit or solemn declaration or report.

[1] For convenience I will utilize Alberta civil procedure.

(3) For the purpose of promoting the fair, orderly and efficient presentation of the testimony of witnesses,
(a) a party who intends to call a person as an expert witness shall, at least thirty days before the commencement of the trial or within any other period fixed by the justice or judge, give notice to the other party or parties of his or her intention to do so, accompanied by
(i) the name of the proposed witness,
(ii) a description of the area of expertise of the proposed witness that is sufficient to permit the other parties to inform themselves about that area of expertise, and
(iii) a statement of the qualifications of the proposed witness as an expert;
(b) in addition to complying with paragraph (a), a prosecutor who intends to call a person as an expert witness shall, within a reasonable period before trial, provide to the other party or parties
(i) a copy of the report, if any, prepared by the proposed witness for the case, and
(ii) if no report is prepared, a summary of the opinion anticipated to be given by the proposed witness and the grounds on which it is based; and
(c) in addition to complying with paragraph (a), an accused, or his or her counsel, who intends to call a person as an expert witness shall, not later than the close of the case for the prosecution, provide to the other party or parties the material referred to in paragraph (b).
(4) If a party calls a person as an expert witness without complying with subsection (3), the court shall, at the request of any other party,
(a) grant an adjournment of the proceedings to the party who requests it to allow him or her to prepare for cross-examination of the expert witness;
(b) order the party who called the expert witness to provide that other party and any other party with the material referred to in paragraph (3)(b); and
(c) order the calling or recalling of any witness for the purpose of giving testimony on matters related to those raised in the expert witness's testimony, unless the court considers it inappropriate to do so.
(5) If, in the opinion of the court, a party who has received the notice and material referred to in subsection (3) has not been able to prepare for the evidence of the proposed witness, the court may do one or more of the following:
(a) adjourn the proceedings;
(b) order that further particulars be given of the evidence of the proposed witness; and
(c) order the calling or recalling of any witness for the purpose of giving testimony on matters related to those raised in the expert witness's testimony.
(6) If the proposed witness does not testify, the prosecutor may not produce material provided to him or her under paragraph (3)(c) in evidence without the consent of the accused.
(7) Unless otherwise ordered by a court, information disclosed under this section in relation to a proceeding may only be used for the purpose of that proceeding.[2]

Section 657.3 is a permissive and not a limitative section. That is, it permits the parties, including the defence to submit expert testimony in documentary form provided that the notice and disclosure requirements of the section are complied with. Sub-sections (3) to (7) of this section are new and provide time lines for the notification of the parties as well

[2] *Criminal Code*, R.S.C., c. C-34, s.657.3.

as limited defence disclosure requirements to the Crown. The Crown in Canada has lobbied for such limitative disclosure requirements against opposition from the defence bar that such requirements violate a defendant's right to full answer and defence. In our accusatorial system the Crown has the evidentiary burden of making its case (beyond a reasonable doubt) and the defence generally bears no duty to forewarn the Crown as to what evidence they will call.

Most civil matters in Canada are governed by the respective Rules of Court of the various provinces. In the case of civil matters falling under Federal jurisdiction the Federal Court Rules would apply. Most of these provincial and federal rules governing expert evidence are comparable. The relevant provisions of the Alberta Rules of Court, for example, provide for notice to the parties, notice of rebuttal witnesses, as well as greater clarity concerning the time lines involved than what we find in the *Criminal Code*. Respecting trial actions that are unlikely to exceed 25 trial days,[3] Rule 218.1 governs:

> 218.1 (1) A party intending to call an expert witness at trial shall, not less than 90 days prior to the day of the commencement of the trial, serve on every party to the action a copy of a substance of opinion statement signed by the expert setting out the following:
>
> (a) the expert's name and qualifications;
>
> (b) the area of expertise that the party calling the expert is seeking to have the expert qualified in;
>
> (c) the substance of the expert's opinion.
>
> (1.1) A party on who a statement has been served under subrule (1) who intends to call an expert witness in rebuttal to the matters mentioned in the statement shall, not more than 45 days from service of the statement, serve on every other party to the action a copy of a statement signed by that expert setting out his name and qualifications and the substance of his opinion.
>
> (2) Unless subrule (1) or (1.1), as the case may be, has been complied with, a party may not call an expert witness to testify without leave of the court.
>
> (3) Where a party proposes to call an expert witness at the trial and to offer in evidence a report by the expert witness, the party shall, without prejudice to the right to any party to

[3] See, Alberta Rules of Court, part 15.1 for the special rules governing trial actions likely to exceed 25 trial days.

> object to its admission in evidence, serve on every other party to the action a copy of the report not fewer than 10 days prior to the commencement of the trial.[4]

Civil rules of court in Canada also typically permit the appointment of an independent expert by the court. Rule 218 of the Alberta Rules of Court provides a good example:

> 218. (1) The court, on its own motion or upon the application of any party in any case where independent technical evidence would appear to be required (including the evidence of an independent medical practitioner) may appoint an independent expert (herein called "the court expert").
> (2) The court expert shall, if possible, be a person agreed between the parties and failing agreement shall be nominated by the court.
> (3) The question or instructions submitted or given to the court expert, failing agreement between the parties, shall be settled by the court.
> (4) The report of the court expert shall be given in writing, verified by affidavit, and shall be admitted as evidence at the trial and given such weight as the court thinks fit.
> (5) Copies of the report shall be forwarded by the clerk to the parties or their solicitors.
> (6) Any party may, within 14 days after receipt of a copy of the report or within such other time as the court directs, apply for leave to examine the court expert on his report and the court, on the application shall
> (a) order the cross-examination of the court expert prior to trial; or
> (b) order the cross-examination of the court expert at the trial.
> (7) The court may make such further and other directions respecting the carrying out of the instructions by the court expert, including the making of experiments and tests.
> (8) Subject to the ultimate determination by the trial judge as to who shall pay the renumeration of a court expert it shall be paid in the first instance by the opposing parties in equal portions at such time as the court directs.[5]

Regarding criminal matters, trial judges do possess a common law discretionary power to call witnesses to testify if the judge deems the witnesses' testimony in the interests of justice.[6] While I find no reported instances of trial judges in Canada calling independent scientific opinion testimony, there is no principled reason why such testimony could not be called, where needed, under this discretionary power.

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[4] Alberta Rules of Court, r. 218.1.

[5] Alberta Rules of Court, r. 218.

[6] *R.* v. *MacPhee* (1985), 19 C.C.C. (3rd) 345 (Alta. Q.B.); *R* v. *Finta* (1992), 73 C.C.C. (3d) 65 (Ont. C.A.), at p. 192; the issue of a judge calling a witness did not arise on the appeal of *Finta* to the Supreme Court, *R.* v. *Finta* (1993), 61 O.A.C. 321 (S.C.C.).

Finally, Section 7 of the *Canada Evidence Act*, which applies in respect of both criminal and civil proceedings, limits the number of expert witnesses that the parties to the proceeding may call:

> 7. Where, in any trial or other proceeding, criminal or civil, it is intended by the prosecution or the defence, or by any party, to examine as witnesses professional or other experts entitled according to the law or practice to give opinion evidence, not more than five of such witnesses may be called on either side without the leave of the court or judge or person presiding.[7]

Under current Canadian law, a party objecting to the admissibility of some particular piece of scientific testimony on reliability grounds would seek a pre-trial ruling on the matter; or, more likely, object during trial and seek a resolution of the admissibility issue during a *voir dire.* In either case the trier of law would then apply the admissibility standard articulated in *R.* v. *Mohan* as it is further elaborated in *R.* v. *J.-L.J.*; i.e. the trier of law would then make a determination if the proposed evidence met the *Daubert* criteria.

Proposed Procedures

As a matter of civil procedure, the notice provisions that we find in civil rules of court, the Alberta Rules of Court for example, are adequate to provide the parties with notice of the other side's intention to call expert testimony and prepare their response. The limitation on the number of expert witnesses imposed by the *Canada Evidence Act* is also reasonable to ensure a time efficient trial; I propose no changes here. The power of a trial judge to appoint an independent court expert, found both in common law and under

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[7] *Canada Evidence Act,* R.S.C., c. E-10, s.7.

rules of civil procedure, is useful a useful one and I propose to integrate it into civil and criminal procedures dealing with admissibility.

I now turn to the procedures that I envision. There is greater latitude for introducing novel case management procedures within the civil context, so I outline two distinct procedures, one envisioned as a civil rule of court, the other as a recommendation for revisions to Section 657.3 of the *Criminal Code*. I should note that my training is not in the drafting of legislation or rules of procedure. The civil model I suggest here is therefore meant to illustrate general procedural guidelines pertaining to notice, disclosure, the pre-trial resolution of admissibility questions regarding scientific testimony, and the use of court-appointed experts as judicial aids. The civil model rule is as follows:

> Civil Model Procedure
> (1) A party intending to call an expert witness at trial shall, not less than 90 days prior to the day of the commencement of the trial, serve on every party to the action, and the court, a copy of a substance of opinion statement signed by the expert setting out the following:
>
> (a) the expert's name and qualifications;
> (b) the area of expertise that the party calling the expert is seeking to have the expert qualified in;
> (c) the substance of the expert's opinion.
>
> (2) A party on who a statement has been served under subrule (1) who intends to call an expert witness in rebuttal to the matters mentioned in the statement, shall, not more than 45 days from service of the statement, serve on every other party to the action, and the court, a copy of a statement signed by that expert setting out his name and qualifications and the substance of his opinion.
>
> (3) Unless subrule (1) or (2), as the case may be, has been complied with, a party may not call an expert witness to testify without leave of the court.
>
> (4) Where a party on who a statement has been served under subrule (1) or (2) objects to the admissibility of an expert witness' opinion, or serves notice of the intention to call an expert witness in rebuttal under subrule (2), the court shall direct a pre-trial hearing not fewer than 10 days prior to the commencement of the trial to determine the admissibility of the opinion.
>
> (5) The court may, on its own motion, direct a pre-trial hearing to determine the admissibility of any opinion offered under subrule (1) or (2).
>
> (6) The court, on its own motion or upon the application of any party, in any case where independent technical evidence would appear to be required to assist the court in its

> determination under subrule (4) or (5), may appoint an independent expert (herein called "the court expert") to carry out such instructions as are ordered by the court.
>
> (7) The court expert shall, if possible, be a person agreed between the parties and failing agreement shall be nominated by the court.
>
> (8) The court may make such further and other directions respecting the carrying out of the instructions by the court expert, including the making of experiments and tests.
>
> (9) The court expert shall prepare a report in writing for the court not fewer than 15 days prior to the pre-trial hearing. Copies of the report shall be forwarded by the clerk to the parties or their solicitors.
>
> (10) The court expert shall be made available for examination by the parties at the pre-trial hearing.
>
> (11) Subject to the ultimate determination by the trial judge as to who shall pay the remuneration of a court expert it shall be paid in the first instance by the opposing parties in equal portions at such time as the court directs.

What the current rules lack is a "front end" involvement of the court in assessing the admissibility of the evidence where conflict emerges implicating the reliability of the testimony. Where issues of the reliability of expert testimony arise, either on direct objection by one of the parties, emerging in proposed rebuttal expert opinion, or in the court's own review of the substance of the proposed testimony, the purpose of the pre-trial hearing would be to hear argument on the question of the admissibility of the evidence and resolve the issue prior to trial. The pre-trial involvement of the court envisioned by this procedure would have the benefit of an early resolution of questions of admissibility, avoidance of undue delay at trial, and possibly the avoidance of a "battle of experts" at trial. The principal procedural recommendations that I suggest therefore involve notice to the court (subrule 1), the pre-trial determination of admissibility (subrules 4 and 5), and the discretion to employ independent scientific experts to assist the trial judge in understanding the technical issues involved in making any admissibility determination (subrule 6).

Providing pre-trial disclosure confers the same advantages in the context of criminal law and it is worthwhile to note that the recent addition to s. 657.3 of the *Criminal Code* reflects a number of my anticipated procedural recommendations.[8] Rather than recite a replacement provision, I will instead note the following recommendations for revision:

1. The disclosure to the court (i.e. the presiding judge) of the intention to call expert evidence, as well as copies of the expert reports and research summaries, should be mandatory.

2. The use of a pre-trial admissibility hearing, either upon the motion of a party, or by the court upon its own motion, should be implemented. If the parties did not invoke this provision, and the court orders such a hearing, the opinion that is the subject of the hearing should be disclosed to the opposing party (of course, the Crown must disclose its evidence, subject to several exceptions).

3. Any expert whose testimony is the subject of a pre-trial admissibility hearing should be available for examination and cross-examination by the parties.

4. The court's discretion to appoint an independent expert and order the expert to carry out the court's instructions, where independent technical evidence would appear to be required to assist the court in its determination of admissibility, should be codified.

5. Where an independent expert is appointed by the court, adequate time should be allowed for the court-appointed expert to execute his instructions.

6. The court-appointed expert should prepare a report in writing and this should be made available to the parties in advance of the pre-trial admissibility hearing.

7. The court-appointed expert should be made available for examination by the parties at the pre-trial hearing.

The revisions envisioned here take section 657.3 of the *Criminal Code* and incorporate pre-trial disclosure to the court of the intention by a party to call expert testimony, provision for the pre-trial resolution of questions concerning admissibility, and the

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[8] In fact, the time-line articulated in s. 657.3(3)(a) are more generous, by about 2 weeks, than what I was recommending.

discretion to employ independent experts to assist the trial judge in understanding the technical issues involved in making any admissibility determination. Many of the same case management advantages arise with this procedure as we find with the proposed civil procedure. The principal difference rests in the fact that the mandatory defence disclosure requirements are to the court alone and, unless the defence elected to disclose to the Crown, would result in disclosure to the Crown only if the court determined a need to address the admissibility of the defence's expert in a pre-trial hearing.

I discuss the standard for the admissibility of expert opinion evidence under the foregoing procedures in Sections 7.2, 7.3 and 7.4.

7.2 General Nature

Under both Canadian law, and U.S. Federal law, the present basis for excluding otherwise relevant, necessary, and properly fielded scientific testimony rests with the discretionary power of a trial judge to exclude evidence where its prejudicial effect is deemed to be greater than its probative value. This is explicitly noted in the two pertinent Supreme Court of Canada cases on point, *R.* v. *Mohan* and *R.* v. *J.-L.J.,* and it is implicit in the U.S. Supreme Court's decision in *Daubert.* Placing the exclusion of scientific testimony under this more general exclusionary power is, I believe, an apt approach. First, as I will discuss further in Section 7.3, it affords some important discretion to trial judges in the decision to exclude evidence. Secondly, the rule captures the rationale for an exclusionary rule, discussed in Chapter 4, very well. Recall that the principal concern of the exclusionary response to the problem posed by scientific testimony is to mitigate the danger of untutored triers of fact relying upon testimony that fails to meet an adequate

threshold of reliability. This rationale embodies precisely the sort of judicial assessment that we find in this general discretionary power.

Let us begin then, by setting out the general standard for the admissibility of scientific testimony. Following *R.* v. *Mohan* and *R.* v. *J.-L.J.*, scientific opinion evidence will be admissible where:

1. the evidence is relevant;
2. the evidence is necessary to assist the trier of fact;
3. the evidence is not subject to exclusion under any exclusionary rule;
4. the evidence is presented through a properly qualified expert.[9]

Our concern in this work rests with the reliability of scientific testimony and the potential prejudicial effect of such evidence upon triers of fact. As I noted above, this falls under the purview of the discretionary power of the trial judge to exclude evidence where the prejudicial effect of the evidence outweighs its probative value. It is becoming commonplace to regard this discretion as an exclusionary rule of evidence. Under this interpretation of the discretion, unreliable evidence of the sort that we are concerned with would run afoul of item (3) from the general *Mohan* standard. If, however, the testimony in question is not deemed overly prejudicial, if it does not run afoul of any other exclusionary rule of evidence, and if the other three criteria of the *Mohan* standard are met, the scientific testimony would be admissible.

7.3 Scope of the Discretion

The power to exclude evidence where the probative value of the evidence is exceeded by its prejudicial effect is described as a "discretionary power" of the trial

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[9] *R.* v. *Mohan* (1994), 89 C.C.C. (3d) 402 (S.C.C.), at p. 411.

judge. The exclusion of relevant evidence is a heavy-handed response that should not be engaged lightly.[10] It is therefore important, I submit, to provide trial judges with some latitude in wielding the power to exclude scientific testimony. Placing the standard for assessing the reliability of scientific testimony under the rubric of this discretion affords precisely this latitude since what is ultimately at issue is the *prejudicial effect* of the evidence in relation to its *probative value.* While ordinarily a determination that some proposed piece of scientific testimony is epistemically unreliable should lead to its exclusion there may, nevertheless, be situations in which the testimony should go before the trier of fact notwithstanding the [purely] epistemic considerations that weigh against admissibility. These situations will normally be those that implicate other important values associated with justice and the public's confidence in the judicial system. Three sorts of situations spring readily to mind. First, there are matters that involve issues that are fundamental to our political morality. Secondly, there are cases that implicate historic inequalities in the law. Thirdly, there are matters that impact upon an accused's right to give full answer and defence. What unites all of these situations is that they are ones in which need for the appearance of justice, in the form of considering *all of the available evidence*, is heightened because of the importance of the issues at stake. In a sense, what is being said here is that, given the issue at hand, the epistemic risk (and consequent prejudicial value) of the evidence is outweighed by the potential value, if true, of the evidence in addressing and resolving some important issue.

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[10] As Chief Justice Dickson of the Supreme Court of Canada stated in *Corbett*: "Rules which put blinders over the eyes of the trier of fact should be avoided except as a last resort." *Corbett* v. *The Queen* (1988) 41 C.C.C. (3d) 385 (S.C.C.), at p. 404.

Some concrete examples of situations in which other justice considerations arguably overwhelm the purely epistemic considerations, in a determination under the trial judge's discretion, will assist the reader. I will examine two cases in which expert scientific testimony was critical to the resolution of the case; though it is important to note that the admissibility of the testimony was not actually challenged in the manner I will suggest in either case. The examples I will use are the U.S. Supreme Court decision in *Brown* v. *Board of Education*[11] and the Supreme Court of Canada decision in *Lavallee* v. *The Queen*.[12] *Brown,* of course, is the famous 1954 U.S. Supreme Court decision holding that school segregation of black and white children constituted a violation of equal protection under the Fourteenth Amendment of the U.S. Constitution. I will utilize this case to discuss discretionary considerations arising from issues fundamental to our political morality. *Lavallee* famously introduced "battered wife syndrome" into Canadian law in assisting the trier of fact to determine whether a battered wife's murder of her abuser constituted an act of self-defence. I will use this case to discuss discretionary considerations arising from historic inequalities and full answer and defence.

The plaintiffs in the *Brown* case argued that the segregation of white and black children into separate schools was unconstitutional under the Fourteenth Amendment. The hurdle that the plaintiffs had to overcome was the earlier 1896 U.S. Supreme Court decision in *Plessy* v. *Ferguson* establishing that "separate but equal" schooling was indeed constitutional.[13] The plaintiffs introduced considerable social scientific evidence from sociologists and psychologists arguing, "that segregated schools inflict

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[11] *Brown* v. *Board of Education,* 347 U.S. 483 (1954).
[12] *Lavallee* v. *The Queen* (1990), 55 C.C.C. (3rd) 97 (S.C.C.).

psychological harm on black schoolchildren in such a way as to make segregated schools for black children 'inherently unequal' to segregated schools for white children."[14] In its ruling, the U.S. Supreme Court dodged the uncomfortable precedent by noting there had been significant changes in American society, education, and possibly the state of psychological knowledge from the time of the *Plessy.* The Court went on to rely heavily upon the social scientific evidence in ruling that separate educational facilities are *inherently unequal* and hence unconstitutional under the Fourteenth Amendment.[15] In essence the U.S. Supreme Court was utilizing the social scientific evidence to distinguish the facts in *Brown* from the facts in the early *Plessy* decision.

The principal study that the Court relied upon was Kenneth Clark's "doll study" of sixteen six to nine year old black schoolchildren within integrated northern schools and segregated southern schools. The children were asked whether they liked to play with a brown doll or a white doll, which dolls had a "bad color," which dolls had a "nice color," and which doll they felt they resembled. In Clark's study 71% of the northern children, and 49% of the southern children identified the brown doll was having a "bad color." When asked which doll had a "nice color" 40% of the northern and 37% of the southern children identified the brown doll. Commentators on the case have noted that the defendants failed to exploit the argument that the study actually could be interpreted to support segregation since a far less percentage of southern segregated black children were

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[13] *Plessy* v. *Ferguson,* 163 U.S. 537 (1896).

[14] Brewer (1998), at p. 1554. *Brown* v. *Board of Education,* 347 U.S. 483 (1954), at p. 494.

[15] *Brown* v. *Board of Education* 347 U.S. 483 (1954), at pp. 494-495. The court famously writes, "Whatever may have been the extent of psychological knowledge at the time of *Plessy v. Ferguson*, this finding is amply supported by modern authority. [n11] Any language in *Plessy v. Ferguson* contrary to this finding is rejected." The "ample authority" that the Court cited in Note 11 was the research findings of Kenneth Clark.

inclined to favor the white doll than their northern counterparts.[16] Aside from this tactical difficulty, the evidence also presented difficulty, at the time it was offered, from an epistemic standpoint.

It is doubtful, given a purely reliability-based standard for the admissibility of expert testimony, that the crucial social scientific and psychological evidence offered in *Brown* would have been admissible. While the conclusions of this testimony have since undergone much more scrutiny, and appear to have gained considerable acceptance, at the time that *Brown* was decided there were numerous shortcomings in the science being proffered that would have impaired the reliability of the testimony.[17] First, the sample size in Clark's study was quite small and thus prone to error arising from subjects with potentially anomalous experiences. Secondly, the study employed quite young children with only a few years of schooling; a relevant consideration given that the test was being utilized to support an argument concerning the effects of school segregation. Thirdly, the terminology of the test was poorly defined in that there was no articulation of what was meant by the terms "good" and "bad." The testing procedures also came under criticism for the ordering of the questions. Most significantly from the standpoint of the use that was being made of the test, there was virtually no effort to differentiate the school experiences of the subjects from other experiences. That is, even if the test did disclose some psychological harm to black children, it provided no basis for causally locating that harm in segregated schooling as opposed to any of the other possible causal candidates.

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[16] See, for example, Kluger (1976) at pp. 355-356.
[17] Brewer (1998) at p. 1557.

In purely legal terms the issue in *Brown* was the interpretation of the Fourteenth Amendment of the U.S. Constitution providing for equal protection under the law. The issue of segregated schooling was, however, a far more fundamental one for American political morality. In social and political terms what was at stake was the integration of southern blacks into the mainstream institutional structures of civil society in the south. Kluger writes of it,

> Probably no case ever to come before the nation's highest tribunal affected more directly the minds, hearts and daily lives of so many Americans.... The decision marked the turning point in America's willingness to face the consequences of centuries of racial discrimination, a practice tracing back nearly to the first settlement of the New World.[18]

Two radically different conceptions of the American state were thus at issue in *Brown*: an earlier conception that continued to regard color as a legitimate basis for social and political distinctions, and a modern liberal conception of civil society rejecting such distinctions and committed to the pursuit of genuine social and political equality between persons. The social science presented in *Brown* was of dubious reliability at the time it was offered but the issue at stake in the case was of heightened significance. Given this significance, the principle of the requirement of total evidence should take precedence over the paternalistic concern to avert the epistemic risks of such evidence. To do otherwise, with so much at stake, provides the public appearance that all was not heard that should have be heard; and that is inimical to justice.

Let us turn to consider the expert evidence utilized in *Lavallee* v. *The Queen*[19] and the potential it raises for the discretionary admission of questionably reliable science. In 1986 Lavallee was charged with the murder of the man she had been residing with in an

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[18] Kluger (1976), at p. x.

[19] *Lavalee* v. *The Queen* (1990), 55 C.C.C. (3d) 97 (S.C.C.).

abusive domestic relationship for between three to four years. Following an argument in their residence, Lavallee killed her partner with a rifle shot to the back of his head as he was exiting the bedroom used by Lavallee. During Lavallee's murder trial she pleaded self-defence and her lawyers introduced a psychiatric assessment of Lavallee from a psychiatrist with professional experience in the treatment of battered wives. The expert testified that the murder of Lavallee's partner, "was a final desperate act by a woman who sincerely believed that she would be killed that night."[20] Lavallee was acquitted by the jury at trial but the verdict was overturned by the Manitoba Court of Appeal on the ground that the psychiatric testimony was inadmissible.[21] The problem for the defence was that under the *Criminal Code* the justification of self-defence requires that one be under a reasonable apprehension of death or grievous bodily harm and that one believes, on reasonable and probable grounds, that one cannot otherwise preserve himself from such harm.[22] That is, the *Code* provisions impose an objective standard on the assessment of the state of mind of the accused: would a reasonable person, comparably situated, have acted similarly? In addition, there was a line of case law, dealing with self-defence, interpreting the *Code* provisions as requiring an apprehension of immediate danger.[23] The Crown's position, which the Manitoba Court of Appeal accepted, was that Lavallee was armed, her abuser was unarmed, there was no attack in progress, and that the jury should have been able to objectively assess the reasonableness of Lavallee's action without the psychiatric testimony.

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[20] *Ibid.*, at p. 104.
[21] This was under the standard of *R.* v. *Abbey,* discussed in Chapter 4 at p. 141.
[22] *Criminal Code,* R.S.C., c. C-34, s. 34(2).
[23] See, for example, *R.* v. *Bogue* (1976), 30 C.C.C. (2d) 403 (Ont. C.A.), and *R.* v. *Whynot* (1983), 9 C.C.C. (3d) 449 (N.S.C.A.).

The Supreme Court of Canada overturned the decision of the Manitoba Court of Appeal and restored the trial acquittal. Justice Wilson summarized the factors under which expert testimony pertaining to spousal abuse syndrome is admissible as follows:

> 1. Expert testimony is admissible to assist the fact-finder in drawing inferences in areas where the expert has relevant knowledge or experience beyond that of the lay person.
> 2. It is difficult for the lay person to comprehend the battered-wife syndrome. It is commonly thought that battered women are not really beaten as badly as they claim; otherwise they would have left the relationship. Alternatively, some believe that women enjoy being beaten, that they have a masochistic strain in them. Each of these stereotypes may adversely affect consideration of a battered woman's claim to have acted in self-defence in killing her mate.
> 3. Expert evidence can assist the jury in dispelling these myths.
> 4. Expert testimony relating to the ability of an accused to perceive danger from her mate may go to the issue of whether she "reasonably apprehended" death or grievous bodily harm on a particular occasion.
> 5. Expert testimony pertaining to why an accused remained in the battering relationship may be relevant in assessing the nature and extent of the alleged abuse.
> 6. By providing an explanation as to why an accused did not flee when she perceived her life to be in danger, expert testimony may also assist the jury in assessing the reasonableness of her belief that killing her batterer was the only way to save her own life.

The court did not, as is often widely believed, establish spousal abuse as a defence to murder or assault. What the court actually did was to permit expert evidence pertaining to the syndrome in order for the trier of fact to better appreciate the alleged psychological condition of the accused and thereby to come to an informed decision as to the reasonableness of the accused's response under the standard *Code* provision for self-defence.

Would the psychiatric testimony presented in *Lavallee* meet the standard of scientific reliability envisioned by my recommendation? There is good reason to suspect that it would not.[24] The expert evidence in the case consisted of the opinion of a

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[24] I will emphasize again that the reliability of the science underlying the expert testimony in *Lavallee* was not at issue. The decision pre-dated *R.* v. *Mohan* by four years and *J.-L.J.* by a decade. It was decided under the standard for admissibility for expert opinion evidence set out in *R.* v. *Abbey*, requiring that the opinion be relevant and helpful in that it pertain to a matter beyond the knowledge and experience of a layperson.

psychiatrist, Dr. Shane, "with extensive professional experience in the treatment of battered wives." Shane based his opinion upon a four hour interview with Lavallee, police and hospital reports, and an interview with Lavallee's mother. Our interest, however, rests with the science underlying Shane's analysis. The psychiatrist's assessment that Lavallee fit the profile of a battered spouse relied upon the research of Dr. Lenore Walker that had pioneered the notion of battered wife syndrome. It was Walker's theory, the 'Cycle Theory of Violence,' and book reporting the results of her empirical test of the theory that took center stage in the Supreme Court's assessment of the evidence.[25] An assessement of the reliability of the science in *Lavallee* must, therefore, focus upon Walker's empirical study.

Walker's empirical study was conducted over a four-year period from 1978 to 1981 and involved 403 women, mostly from the Denver area, who volunteered for the study. All of the participants had been the subject of battering as defined prior to the study; of these 50% reported that they could possibly kill their abuser, 11% said that they had tried to do so, and 9 woman had actually succeeded in killing their abuser.[26] Most of the volunteers were no longer involved in a battering relationship.[27] The study consisted of a 200-page questionnaire designed to measure demographic and psychosocial variables that might be associated with battering, to test specific theories about battered women, and to collect data on battered women. The study was administered by women - with a preference for those possessing clinical sensitivity to the issue - and conducted in an

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[25] See *Lavallee* v. *The Queen*, at pp. 117-125.
[26] Walker (1984), at p. 39.
[27] *Ibid.*, at p. 229.

open-ended interview format aimed at providing an environment of comfort and trust between the interviewer and the subject.

From the standpoint of reliability the qualitative approach of the Walker study has shortcomings as an empirical test. First, the sample size utilized in the study is relatively small - and extremely small with respect to the number of respondents in the test group who actually did kill their abusers. This makes it difficult to assess error rates and increases the risks of false correlations. The limited number of participants who actually attempted to kill their abusers also decreases the value of the study with respect to the most important question from the standpoint of Lavallee's claim of self-defence: was her state of mind such that a similarly situated individual would have perceived her act as reasonable.[28] The study was administered without a control group.[29] The absence of a control group, unexposed to the same phenomenon, limits the usefulness of the responses elicited in drawing generalizable conclusions; that is, the test lacks the means to identify salient differences between the responses of women from the exposed group and those from the general population. The fact that the respondents were chosen primarily from one geographical region renders it more difficult to screen out potential environmental factors. More significantly, the fact that the respondents themselves approached the researchers to participate, were aware of the aims of the study, and that nearly all of the

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[28] The only expert comment noted by the Supreme Court with respect to this question is mention of an article by the psychologist Julie Blackmun asserting that, "Repeated instances of violence enable battered women to develop a continuum along which they can 'rate' the tolerability or survivability of episodes of their partner's violence." *Lavallee* v. *The Queen,* at p. 119. Absent quantifiable research concerning this learned ability one wonders: what exactly establishes its existence? Some women kill their abusers and others do not; their abusers kill many more women than women who kill their abusers. To say that the mere fact that a woman killed her abuser is evidence that she successfully developed this ability is, without more, simply question begging.

respondents were women who had successfully disengaged from the abusive situation, raises a real risk of selection bias. This is to say that awareness of the aims of the study, and sympathy toward those aims on the part of those participating, cannot easily be discounted as a potential confounding variable. To this is added the fact that those administering the questionnaire in an open-ended interview format were also aware of the research goals and, through the selection process, chosen on the basis of factors that would suggest sympathy with the research aims. There is, of course, substantial anecdotal and clinical observation to provide a source for the generation of Walker's cycle of violence hypothesis and to rule out the traditional mythology associated with domestic violence. A promising hypothesis is different, however, from a theory supported by reliable testing and testing methodology.[30] The reliability of the empirical test underlying the theory employed by the defence expert, and unaddressed in the *Lavallee* decision, is questionable without this sort of quantitative research.

The *Lavallee* case illustrates two grounds for erring on the side of the admission of questionably reliable science. First, it is an example of a case that implicates historic inequalities in the law - that is, the law's treatment of women and, in particular, its treatment of violence toward women. Secondly, as a case involving criminal liability, it illustrates considerations that must factor into judicial discretion given the accused's right to full answer and defence. I will begin by discussing the concerns arising from historic inequalities.

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[29] The reasons for the lack of a control group in the study are unclear. At one point Walker attributes it to a decision to avoid any implication of the victim-blaming model, Walker (1984), at p. 112. At another point she identifies time and expense as the salient factors in the decision, *ibid.*, at p. 203.

[30] Dr. Walker was aware of the limitations noted here and acknowledges that they constrain both the reliability and generalizability of the study. *Ibid.*, at p. 228.

I suspect that the mere suggestion that the science underlying the *Lavallee* decision was unreliable will draw considerable hostility from some quarters.[31] Could one not argue that, but for latent prejudices within the scientific, medical, or psychiatric communities there would have been plenty of reliable science to support the opinion? Indeed, the point was put to me by a colleague: isn't there something unjust about the law entrenching standards of reliability that, owing to systemic shortfalls (for example, in the scientific community), would lead to the exclusion of vital evidence?[32] This is, however, precisely the point I wish to make. Legal inquiry, unlike scientific inquiry, does not have as much luxury with respect to time. Decisions about reliability must be made on the basis of the state of the science at the time of the trial. So, when our concern is with science that does not meet the requisite standard of reliability, there simply is no principled *epistemic* way to distinguish between the 'good science' that we like (because, for example, it holds promise for explaining some of the tragedies associated with domestic violence), and the 'bad science' that we don't like (because, for example, as in the *Barefoot* v. *Estelle* case, we see it resulting in an injustice). We are limited to the epistemic means available at the time of the trial. Fortunately, no epistemic gymnastics are required to address this concern for at the level of judicial discretion, there is greater latitude to consider all of the ramifications of the evidence.

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[31] This is a debate that tends to become highly politicized all too quickly. For some a 'quantitative' approach to psychology is branded immediately as anti-feminist. For others, the adoption of a 'qualitative' approach to psychology is tantamount to endorsing mere speculation. To those who are tempted to read my analysis in the light of the former statement, I wish to emphasize that characterizing a study as 'unreliable' is not the same thing as asserting that the underlying hypothesis is false, or that the experiences reported should be dismissed, or that the goals of the research are without merit.

[32] My thanks to Leanne Kent for raising this point with me. It is worthwhile to note that Walker's study makes mention of resistance encountered within the discipline (psychology) and frequently notes

Epistemic factors are not the only considerations that a trial judge must consider when deciding whether to exercise the discretion to exclude scientific testimony that fails to meet the envisioned standard of reliability. Social inequalities do exist and we know that our institutions, legal and scientific, are vulnerable to the tacit embedding of these inequalities in a variety of theoretical and institutional choices. In the *Lavallee* case we confront the 'deep roots' of violence toward women in our culture; violence that was only too often condoned or ignored by the justice system. Notwithstanding the abandonment of the formal approval of domestic violence, courts must still exercise vigilance with respect to less overt manifestations of the same attitudes. As Justice Wilson noted in *Lavallee*:

> [T]here has been a growing awareness in recent years that no man has the right to abuse any woman under any circumstances. Legislative initiatives designed to educate police, judicial officers and the public, as well as more aggressive investigation and charging policies all signal a concerted effort by the criminal justice system to take spousal abuse seriously. However, a woman who comes before a judge or jury with the claim that she has been battered and suggests that this may be a relevant factor in evaluating her subsequent actions still faces the prospect of being condemned by popular mythology about domestic violence. Either she was not as badly beaten as she claims or she would have left the man long ago. Or, if she was battered that severely, she must have stayed out of some masochistic enjoyment of it.[33]

Given the inequalities in the law, as highlighted in *Lavallee*, it is right and fitting that special consideration should be given to the use of expert testimony where it is deployed to provide clinical observation and theoretical insight that may serve to counter the popular mythology that Justice Wilson describes. This is to say that the moral and political stake we have in reversing inequalities within the justice system should tend toward the inclusion of evidence notwithstanding the epistemic risks posed by the

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limitations on the nature of the study that were a consequence of a lack of adequate funding. Ms. Kent may have a fair point.

[33] *Lavallee* v. *The Queen*, at p. 113.

evidence. To do otherwise by mechanically excluding relevant expert testimony risks that the law will continue to entrench longstanding inequalities that bring the administration of justice into disrepute.

The *Lavallee* decision also illustrates how, in the criminal context, considerations pertaining to a defendant's right to full answer and defence may enter into a trial judge's determination of whether to exercise his discretion to exclude scientific testimony. In Chapter 6 we saw that the right of full answer and defence is entrenched within the common law, the *Criminal Code*, and constitutionally within the *Charter of Rights and Freedoms*. The ability to present one's own defence and, within the bounds provided by relevance and reliability, offer into evidence any testimony that would assist in that defence, is a feature of this right. Consequently, where the scientific testimony in question is offered by the defence, as it was in *Lavallee*, the decision to exclude the testimony under the trial judge's discretionary power must be wielded reluctantly. Indeed, absent the expert's evidence in *Lavallee*, her chances of making out the claim of self-defence were slight. Justice McLachlin speaks to this reluctance to exclude defence testimony under the discretion in *R.* v. *Seaboyer*:

> The Canadian cases cited above all pertain to evidence tendered by the Crown against the accused. The question arises whether the same power to exclude exists with respect to defence evidence. Canadian courts, like courts in most common law jurisdictions, have been extremely cautious in restricting the power of the accused to call evidence in his or her defence, a reluctance founded in the fundamental tenet of our judicial system that an innocent person must not be convicted. *It follows from this that the prejudice must substantially outweigh the value of the evidence before a judge can exclude evidence relevant to a defence allowed by law.*[34]

With respect to expert testimony in particular, the Supreme Court echoed this point in *R.* v. *J.-L.J.* stating, "The Court's gatekeeper function must afford the parties the opportunity

to put forward the most complete evidentiary record consistent with the rules of evidence."[35] Of course, in *J.-L.J.* the court, in the end, upheld the decision to exclude the unreliable testimony of Dr. Beltrami that the defence sought to adduce. There is no precise calculus for weighing how much prejudice must attend the expert's evidence before a trial judge is warranted in excluding the testimony. Despite the lack of such a precision I submit that, with respect to *Lavallee*, we can safely say that the evidence would be admissible given the balancing of factors that I describe here. Not only was the evidence presented by the defence in a criminal prosecution, thereby falling under the general reluctance to exclude such evidence, but it could also be regarded as an important antidote to latent misconceptions concerning domestic violence extant within the judicial system and wider society.

My introduction of non-epistemic considerations into the equation when determining, under judicial discretion, whether to exclude questionably reliable scientific testimony should prompt an obvious objection. In Chapter 1, I asserted that veritism, truth-seeking, is fundamental to justice. Much of this work has been devoted to demonstrating that, given the epistemic requirements of the law, procedures are necessary to screen out unreliable scientific opinion evidence from trier of fact consideration. A critic may readily object that, by introducing the non-epistemic considerations addressed above into a determination of admissibility, I am backpeddling from my claim that veritism is fundamental to justice. The short answer to this objection would appear to be affirmative. I submit, however, that the recognition of these non-epistemic considerations

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[34] *R.* v. *Seaboyer* (1991), 66 C.C.C. (3d) 321 (S.C.C.), at p. 391. Emphasis added.
[35] *R.* v. *J.-L.J.* [2000] 2 S.C.R. 600, at p. 613.

does not diminish the fact that truth seeking is fundamental to justice; rather, it simply acknowledges that justice is constituted by a bundle of values that may, at times, come into conflict. This is not an unusual situation; in the context of *Charter* litigation trial judges occasionally confront situations in which rights must be balanced:

> A hierarchical approach to rights, which places some over others, must be avoided, both when interpreting the Charter and when developing the common law. When the protected rights of two individuals come into conflict, as can occur in the case of publication bans, Charter principles require a balance to be achieved that fully respects the importance of both sets of rights.[36]

At these times it is the historic province of triers of law to render the balancing of values that is necessary to achieve justice. Neither, for that matter, is the law entirely bereft of epistemic safeguards in cases where, for non-epistemic reasons of the sort articulated here, scientific evidence goes before a trier of fact that should, on purely epistemic grounds, be inadmissible. First, it remains possible for the evidence to undergo adversarial challenge by the opposing party at trial. Secondly, one would expect special scrutiny by the trial judge to ensure that the expert does not overstep the epistemic limitations of the evidence; for example, by exaggerating the reliability of the inferences drawn from the testimony. Finally, judicial warnings to the trier of fact concerning the reliability of the scientific testimony would certainly be appropriate in such cases.

7.4 The Standard

Thus far I have outlined the procedures and the general nature of the exclusionary approach for scientific testimony that I am advocating. Let us now consider the standard of admissibility concerning a determination of prejudicial effect weighed against

probative value. To begin with, while the admissibility of some piece of scientific testimony is a factual matter to be determined on a case-by-case basis, if similar scientific testimony has been the subject of review and found admissible by a court of appropriate jurisdiction, this will ordinarily be dispositive of the issue as a practical matter. There are two exceptions to these more routine applications of science. First, in the civil context this may occur where a party opposing the admissibility of the testimony alleges, under subrule (4) of the model civil procedure above (Section 7.1), some problem particular to the evidence in question - for example, that procedures proper to a reliable opinion were not followed in establishing the substance of the opinion under either subrule (1)(c) or, in the case of a rebuttal expert, under subrule (2). Secondly, in the criminal context, concern as to the reliability of otherwise admissible science may arise from a party's pre-trial disclosure to the court of the substance of the expert's opinion, or in the context of an objection to this effect during the trial itself.[37] In the event of any of these challenges the trier of law would move directly to a consideration of matters under Topic (3) of the admissibility inquiry described below. Where the testimony in question lacks an established track record of court application that can serve as a basis for such analogical reasoning a trial judge's assessment of admissibility will consider all of the matters discussed under Topics (1), (2) and (3).

I divide the trial judge's assessment of the reliability of scientific testimony into three topics of consideration.

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[36] *Dagenais* v. *Canadian Broadcasting Corporation* (1995), 94 C.C.C. (3d) 289 (S.C.C.), at p. 316-317. See also *R.* v. *Mills* (2000), 139 C.C.C. (3d) 321 (S.C.C.).

Topic (1): Does the testimony concern matters that admit reliable inquiry?[38]

Reliable inquiry depends upon empirical testing. Matters that are the subject of expert scientific opinion must, necessarily, be capable of empirical test. That is, the theories upon which the opinion is founded must possess observable consequences that can be tested for, as well as a genuine expectation of observations that would falsify the theory. If the theory in question is not capable of empirical test, either in principle or in practice, then the theory cannot be deemed [legally] reliable. In this event, the prejudicial effect of the testimony will ordinarily be deemed to outweigh its probative value.

If the testimony in question does admit reliable inquiry a trial judge should proceed to consider the issues under Topic (2).

Topic (2): Does the empirical methodology employed within the field that is the subject matter of the testimony meet a sufficient degree of reliability for admission of the testimony into evidence? Specifically:

(2)(i) Has the theory upon which the opinion is based undergone empirical testing? The field of science underlying expert testimony must not only be capable of empirical test (Topic 1), but it must also have undergone empirical test and the results of such testing should be consistent with predicted outcomes. Under this category a trial judge would assess whether the field in question has undergone experimentation that provides observable outcomes that lend inductive support (confirmation) to the theories

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[37] In the context of an objection raised at trial this sort of inquiry would be the subject of a *voir dire.*

[38] The reader will note that this standard is comparable to the present standard set out by *R.* v. *J.-L.J.* This should not be surprising, as *some* of the *Daubert* imported criteria are indeed reliability-based. The main contrasts with the *J.-L.J.* standard are: the elimination of the surrogate indicators of reliability (peer review and publication, and general acceptance), the expanded articulation of reliability-based criteria under Topic (2), and the procedural introduction of independent court-appointed experts to assist the trial judge.

in the field, as well as observational consequences that have a genuine expectation of falsifying theories in the field.

(2)(ii) Does the methodology employed by the field account for relevant variables? Under this category a trial judge would consider the testing procedures employed by the relevant field to determine if the methodology employed correctly classifies and accounts for the variables relevant to empirical testing within the field.

(2)(iii) Does the methodology employed by the field provide data on the error rates relevant to empirical testing within the field? Under this category a trial judge would determine if the field maintains data on error rates pertaining to empirical testing in the field. Ordinarily, error rates should be identified and should meet appropriate professional standards.[39]

(2)(iv) Does the methodology employed within the field provide adequate sampling within its empirical testing? Under this category a trial judge would consider the sample sizes utilized within empirical testing in the field. Sample sizes should be sufficient to increase the probability of identifying false correlations, detect deviant samples, and establish the rate of false positives, false negatives and the size of the effect.

(2)(v) Does the field employ proper mathematical modelling? Under this category the trial judge would determine if the field in question utilizes data that is sufficient to define the correct mathematical relationship between the variables and properties at play.

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[39] The Good Laboratory Practices (GLP) and Good Clinical Practices (GCP) rules utilized by the Food and Drug Administration and Environmental Protection Agency within the U.S., and the prescriptive standards set out by the Association of Official Analytic Chemists International, provide good examples of such professionally established standards. See, Foster and Huber (1997), at pp. 100-101.

Satisfaction of the foregoing methodological criteria is construed as necessary conditions to the reliability of the field of expertise under consideration. That is, affirmative answers must be attained to all of the foregoing questions in order for the field in question to be deemed [legally] reliable. A negative response would ordinarily result in the exclusion of the testimony under the trial judge's discretion to do so where the prejudicial effect of the evidence outweighs its probative value. Of course, science is heterogeneous and mechanical standards for articulating what constitute reliable methodological standards across various fields under these categories are unrealistic. In cases where making these assessments is difficult, or the sources of the requisite information is not readily accessible to the trial judge, it will be necessary for the court to seek the assistance of an independent court appointed expert - a matter that I will discuss further momentarily.

Topic (3): Did the expert employ reliable methods as found under Topic (2) in the formulation of his opinion?

Topic (2) considers whether the field that the expert belongs to utilizes reliable methods. Under this third topic of consideration a trial judge would consider whether the expert employed the reliable methods articulated under Topic (2) in the formulation of his opinion. Ordinarily, such questions are more properly matters of weight that should be left to the trier of fact after proper adversarial questioning. In Chapter 3, however, I noted some of the more notorious difficulties that may arise from relying upon the adversary system to yield a proper weighting by jurors. Consequently, where there is clear evidence emerging, either in pre-trial reports or within a *voir dire* following an objection at trial,

that could reasonably establish that the procedures listed under (2) were not followed by the expert (for example, through omission, ignorance or fraud), it would be within the trial judge's discretion to exclude the evidence on the ground that the prejudicial effect of the testimony outweighs its probative value.[40]

7.5 Addressing the Success Conditions

How well do the preceding test and procedural requirements perform given the efficiency and principled requirements set out in Chapter 4? From the standpoint of efficiency, requiring pre-trial disclosure to the court, opening the door to the pre-trial resolution of scientific admissibility issues, and introducing the device of the court-appointed expert, all add to the cost, time and complexity of the legal process. Of course, given the inadequacy of the standard inclusionary model to adequately meet the epistemic needs of the law, some trade-off is necessary. The mechanisms introduced are not unusual from the standpoint of existing law and procedure. At the present time, many constitutional and evidentiary issues are typically resolved prior to opening arguments.[41] The recently revised section 657.3 of the *Criminal Code* anticipates some of the disclosure and timeliness considerations that I have emphasized in this work. Finally, while seldom utilized, the device of the court-appointed expert is nothing new to either civil or criminal procedure. I submit that, provided the recommended test and procedures

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[40] The exclusion of the testimony of Dr. Beltrami in *R.* v. *J.-L.J.* would arguably fall under this topic of consideration. The court's key concerns focused on the lack of evidence concerning error rates and the testing that supported Beltrami's application of penile plethysmographic techniques to deviant profiling. The court was not challenging the science underlying either psychiatry or the plethysmographic technique in its proper therapeutic role; see *R.* v. *J.-L.J.* [2000] 2 S.C.R. 600, at pp. 614 and 616.

do yield epistemic and case management gains, they are warranted from the standpoint of cost and time.

What about the principled character of my recommendations? The test proposed aims, like the present *J.-L.J.* standard, to make the admissibility of scientific testimony turn upon the demonstrated reliability of the evidence. The problem with the *J.-L.J.* standard in this regard is that the *Daubert* criteria adopted by the test are either indirectly associated with reliability or too slim to enable principled decision making. In Chapter 5, I argued that the 'uncertainty model' proposed by Limpert does a much better job of articulating criteria that are directly associated with the reliability of a scientific opinion. What I have done here is to focus that model into a structured set of questions that a trial judge must answer:

(1) Is the matter capable of empirical test?
(2) Is there a reliable methodology underlying the opinion?
(3) Has the methodology been followed?

The methodological questions involve the trial judge in an analysis of five broad categories, based in part on Limpert's proposal and existing law, that are directly associated with the reliability. Several of Limpert's categories of uncertainty were not selected because they are either difficult to quantify or involve uncertainties that logically arise at a different stage of the process (for example, what he calls communicative and cognitive uncertainty).

In Chapter 5, I objected to Limpert's reliability based criteria for assessing scientific evidence on the ground that the proposed test was inefficient. That is, inexpert

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[41] Notable examples include issues arising from the Crown's obligation to disclose evidence to the defence and *Charter* arguments pertaining to the admissibility of Crown evidence (e.g. evidence arising

triers of law could not be expected to possess the requisite background required to effectively assess complex scientific testimony utilizing the criteria that Limpert articulates. Why doesn't the same objection arise with respect to my proposal? The criteria that I propose are certainly no less challenging for the generalist trial judge to apply. Herein resides the significance of the procedures introduced for the use of court appointed experts - motivated by my Chapter 6 discussion of Langbein's account of the continental approach and Goldman's non-adversarial alternative. While the use of independent experts to supplant party experts at trial is too radical, the notion of 'judge's aids' that underlies the continental approach has some merit in our adversarial context. In both *Daubert* and *J.-L.J.* the respective Supreme Courts have complicated the nature of the gatekeeping role performed by trial judges in respect of scientific testimony; a move that is endorsed by my own proposal here. Trial judges are now called upon to assess for themselves the reliability of the science that comes before them. We cannot expect trial judges to become scientists and, in the context of complicated scientific testimony, it is too much to expect that judges will be able to apply the sort of criteria articulated here unaided (or rather, to do so without running a risk of botching the matter). The natural remedy, I contend, is to introduce court-appointed experts as judge's aids to assist them in understanding what they need to appreciate in order to effectively make use of the standards articulated. The introduction of procedures to employ such independent experts, I submit, deflects the principal objection that I leveled against Limpert's standard in Chapter 5 and renders this proposal adequate from both efficiency and principled standpoints.

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from a search).

7.6 Loose Ends

The legal response that I advocate here is what I characterized as an exclusionary approach. In Chapter 4, I observed that an exclusionary approach of the sort that seeks simply to screen out injurious testimony, in this case scientific testimony that is not sufficiently reliable, only mitigates the epistemic dangers associated with admitting such evidence. It does not, however, provide a solution to the more fundamental underlying problem. This problem, I argued, arises because legal inquiry requires internalist justification; that is, that the trier of fact possess positive warrant or justification for his determinations of fact. This degree of justification will often prove impossible, however, where the facts are founded upon expert scientific testimony that the trier of fact is in no adequate position to evaluate. The exclusionary approach mitigates this problem by attempting to provide a safeguard at the courthouse door: only scientific testimony that meets a specified (high) threshold of reliability will ordinarily go before the trier of fact.

Unfortunately, once scientific testimony is through the courthouse door, the failure of this approach to address the underlying problem posed by epistemic dependence in the legal context leaves two of the problems with scientific testimony canvassed in Chapter 1 unscathed. These problems are, of course, the problem presented when good science is undervalued by a jury that is incapable of assessing it, and the problem presented when conflicting opinion evidence is presented by oposing scientific experts (the so-called battle of the experts). I will not pretend to have a solution to these potential difficulties. Goldman's non-adversarial approach does hold forth some prospect of addressing these problems but I argued that it does so at the price of values considered

to be fundamental within our social and political tradition. My proposal here has consequently been framed within the structure provided by our existing legal system and, as long as that system depends upon inexpert fact-finders, the eradication of these two problems seems unlikely.

Lest the reader construe this as a counsel of epistemic despair, I submit that there are ways in which a responsible adversarial system could improve its treatment of scientific testimony and decrease the potential dangers arising from opposing expert opinions or jury undervaluation of scientific testimony. There are two avenues of improvement that I will discuss here. The first concerns the use of independent court-appointed experts and the second concerns the responsibility that the legal community has to responsibly manage the use of science in the courtroom.

My proposal envisions far greater use of court-appointed independent experts than is presently the case under the existing rules of civil procedure or, in the criminal context, under the judge's discretion to call witnesses. While the principal function of the court-appointed expert in my scheme is that of a judge's aid, it is reasonable to expect that the greater use of independent experts could go some distance toward mitigating the difficulties arising from both 'the battle of the experts' as well as potential juror underevaluation of scientific testimony. The former problem arises from having two partisan and conflicting authorities that the trier of fact lacks the epistemic resources to choose between. The latter difficulty can emerge from skilled questioning that attempts to exploit the lay perception of scientific certainty and the reality that uncertainty is simply an unavoidable feature of all scientific inquiry. The independent expert would be available for questioning by the parties or perhaps even called to testify by the judge.

Either way, the opportunity is there for the trier of fact to hear from a witness that possesses no connection to the parties and therefore can be seen by the layperson to represent more unequivocally the relevant scientific community. In the 'battle of the experts' scenario this 'neutral' perspective could provide a basis for jurors to navigate between extreme claims by partisan experts. The prospect of a non-partisan expert presence might also tend to moderate some of the excesses that partisan experts are occasionally prone to, since the partisan expert would know, as he knows when he submits for publication, that he is under the scrutiny of his scientific peers. In the case of juror underevaluation of scientific testimony the potential gain from yet another opinion is less clear. The presence of a non-partisan expert witness that, in a sense, simply represents the scientific community might, however, assist jurors in appreciating the true significance of the uncertainties that adversarial questioning seeks to exploit. Of course, the use of the independent expert is no panacea so long as the process remains adversarial. To really see improvement in the courtroom use of science the other actors in the drama must do their part as well.

The second avenue for improvement concerns the legal community itself. It is a banal but important observation that the quality of any legal system depends in a large part upon the quality of its practitioners. Individual lawyers and judges, as well as legal professional bodies (the Bar Association), all have a professional responsibility to ensure that the system of legal inquiry functions optimally. Where that inquiry includes scientific testimony legal practitioners have a duty to deal with it competently and in a manner that is consistent with the canons of legal ethics. These responsibilities vary together with the sources and the improvements that could be suggested. Let us then briefly examine the

sources of these responsibilities together with the ways in which the effective discharge of such responsibilities could improve the treatment of scientific testimony.

(1) The Individual Lawyer. Lawyers possess a duty to their clients and duties as officers of the court.[42] The former requires that a lawyer provide his or her best representation to the client. The latter requires, among other things, that the lawyer not knowingly mislead the court. Both of these duties imply that the individual lawyer maintain competence in all areas in which he or she practices and "strive to attain the upper range" of the competence continuum. The *Alberta Code of Professional Conduct* states the relationship as follows:

> The competence of lawyers is essential to the satisfactory operation of the legal system since it directly affects the ability of clients to enforce and benefit from legal rights. This principle applies whether a lawyer is acting as an advocate in the courtroom, where the proper functioning of the adversary system is dependent on the competence of counsel for all parties, or as a solicitor (for example, in the preparation of a contract).[43]

Where the individual lawyer's practice will involve the use of scientific testimony the lawyer consequently has a duty acquire sufficient knowledge and competence to use it properly. This does not mean that lawyers have to become quasi-scientists or even that they come to fully understand the science that they will introduce. It does mean, however, that they should be aware of what the law requires regarding the introduction of the expert opinion, and that they familiarize themselves with the nature of scientific reasoning and the special concerns that arise from the presentation and cross-examination of the scientific witness.

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[42] *Alberta Code of Professional Conduct,* Chapter 10. Prosecutors, as noted in my Chapter 3, have special duties - most significantly, to see that justice is done through a fair trial on the merits of the case, see Chapter 10, rule 28.

[43] *Ibid.,* Chapter 2, Commentary, G.1.

When lawyers take this duty seriously and avail themselves of the self-help resources available it improves the functioning of the legal system. This is no different in the case of the courtroom use of science. For example, many problems arising from error and exaggeration, discussed in Chapter 3, can be avoided through proper advocate preparation. The commonplace prosecutor's fallacy is often overlooked because lawyers (who are, in this respect, not all that different from laypersons) often lack the statistical knowledge that would enable them to make the necessary discriminations. Once, however, the fallacy is carefully explained the lawyer is in a position to avoid it in his questioning of the witness. An appreciation of the issues involved with scientific testimony can also assist the lawyer in counteracting, through effective advocacy, what I characterized as the exploitation of the myth of scientific objectivity. The notorious result in the O.J. Simpson murder trial can be attributed, in part, to the juror underevaluation of the scientific evidence presented by the prosecution. The mishandling of the scientific evidence, and the failure of the prosecution to take seriously and dispel the conspiracy theory presented by the defence, is a recurring theme in Bugliosi's critique of the Simpson prosecution. A good example of this critique centers on the defence contention that the DNA evidence in the case was contaminated. Much of the defence cross-examination of the L.A.P.D. forensics team was devoted to establishing this perception among the jurors - a perception that the defence would then build into the frame-up theory. The prosecution chose to call the forensics team members first, and then examine their DNA expert as to the science underlying the forensics. By then, however, the defence cross-examination had already succeeded in creating a strong first impression. By overestimating the ability of the jury to evaluate the evidence the prosecution thereby

failed to emphasize the point that all samples are contaminated to some degree and that contamination, if severe enough, would result in an inconclusive match rather than a false positive.[44] Greater awareness of juror limitations, and how easily the uncertainties in science can be effectively exploited, would have enabled the prosecution to better combat the advocacy of the defence.

(2) The Bar Association. The practice of law is a professional activity and self-regulated by a professional body: the Bar Association. Various duties and responsibilities attach to the Bar Association that are attendant to this privilege of self-regulation. The Bar Association is responsible for the certification of its members as competent to practice law within its jurisdiction and for disciplining its members for malpractice or breaches of the lawyer's professional ethics. This responsibility begins at the start of the lawyer's career with the examinations and requirements set by the Bar to maintain standards of professional competence. It continues throughout the lawyer's career through the provision of resources (materials, workshops, etc.) to assist members in maintaining their competence as well as through the procedures meant to regulate and discipline practitioners.

Whether one approves or not, scientific testimony has become a fixture in the contemporary courtroom. As science and technology comes to play an ever-increasing role in our lives in general, we must expect that its interaction with legal inquiry will only increase. Through its responsibility for certification and regulation the Bar Association possesses a positive duty to improve the use of science in the courtroom. At the present, there is no mandatory requirement in Alberta for lawyers to participate in continuing

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[44] Bugliosi (1996), at pp. 138-139.

legal education programs. While there is a case to be made for mandatory programs to maintain and enhance competence in one's areas of specialization I will confine myself to noting the importance of providing the means for self-help through the auspices of the Bar Association. As an umbrella organization with resources at its disposal the Bar is well-situated to raise awareness and organize both the material and educational resources required to acquaint lawyers with the special issues and difficulties arising from scientific testimony. The use of Bar sponsored 'workshops' concerning the use of scientific testimony could be a particularly effective means of self-help.[45] Seminars on specific topics, such as proper questioning where statistical evidence is involved, and led by lawyers with extensive experience in the use of scientific evidence, could identify points of concern, provide exemplars, and direct the attention of participants to valuable secondary resources. Although we cannot expect to turn lawyers into scientists through these measures the resources do exist to prepare and familiarize lawyers with the proper use of scientific testimony.

(3) The Judiciary. As triers of law, judges have a duty to be highly proficient in their knowledge of the law. A recurring theme throughout this work has been the 'gatekeeping role' that judges must play in cases involving scientific evidence. To this we may add the role of managing a trial that will involve scientific testimony. The demands of this case management role, especially where judges are called upon to determine the reliability of scientific testimony - as they must in the present *J.-L.J.* standard or under my own recommendation - consequently requires that judges possess considerable

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[45] Models of continuing legal education along the lines envisioned here do exist. The Federal Crown, for example, employs a device called 'Crown school' in which federal prosecutors in local offices will prepare

familiarity with the language, methods, and potential difficulties associated with science in the courtroom. This need, on the part of judges, to engage scientific issues was a large part of my motivation for recommending greater use of the court-appointed independent expert. Beyond this, however, there is also value to be gained from providing the judiciary with the means, much as I noted with respect to the Bar Association's role in educating lawyers, for self-help. Programs for continuing judicial education already exist but there are further measures that could be taken to enhance the quality of the courtroom use of science from the judicial end. In Chapter 6, I noted that, at the superior court level, the prevailing model is that of the generalist judge. Introducing some degree of specialization at the superior court level could assist by ensuring that, where science is at issue, the presiding judge would be particularly familiar with the procedures, issues, and special challenges involved. This could be achieved, for example, by maintaining a pool of justices with past experience in cases involving scientific testimony from which the presiding judge would be selected. Such a scheme, of course, would involve notice by the parties of the intention to call scientific testimony as outlined in Section 7.1.

7.7 Conclusion

Many years ago a colleague of mine, who was at the time a sessional professor in the Philosophy Department at the University of Alberta, was asked to teach the department's philosophy of law course. My colleague's area of specialization was logic and philosophy of science so, understandably, he was soliciting ideas about what he should cover in the course. I recall a department party in which another colleague advised

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presentations on specific evidentiary issues for discussion with their colleagues.

that, "Oh, that is easy, there really is only one issue in the philosophy of law." Meaning, of course, the perennial question about the nature of law. It is a shame that philosophy's interest in the law rarely extends beyond this important and too well trod ground. To focus so exclusively on this metaphysical question ignores the many valuable contributions that philosophical inquiry can offer when applied to issues in the law. This project has offered a small step in the direction of that wider intercourse between law and philosophy.

While the step in the direction of an intercourse between philosophy and law is small, it nevertheless admits of many challenges. Perhaps the greatest challenge in a piece of applied epistemology, such as this, rests with reconciling tensions that arise between the two disciplines. These tensions can arise at macro-level, involving differences regarding the overall goals of the project, and at the micro-level as well, involving such things as the finer details of a recommendation. As a philosopher, and in particular as an epistemologist, one is inclined to ask: what is the best epistemic solution to the problem? If this involves overturning the entire history and development of our legal system, so much the better! If it involves recommending complex procedures that would, if ever actually implemented, constitute intellectual torture for the fellow on the bench who has to actually apply them, well, best find some more able judges. As someone with legal training, and a modicum of familiarity with lawyers and the legal system, one is inclined to feel the weight of the vast edifice that is the law ever pulling one's loftier philosophical aspirations to the ground. One is inclined to constantly ask: is the proposal feasible? What legal difficulties would it encounter and can they be overcome? In this work I have attempted to balance epistemic analysis with legal analysis and, in particular, with an

appreciation of what is feasible at law as well as the variety of non-epistemic ends that, from a legal perspective, enter into any realistic appraisal of legal technology.

I began this project with a legal issue that has attracted much debate in the U.S. for the past fifty years, and which is beginning to attract attention within Canadian courts: how should our law of evidence deal with expert scientific opinion evidence? When analyzing the question it is helpful to adopt an epistemic standpoint. Legal inquiry, after all, is veritistic inquiry that seeks the true facts of a dispute so that legal sanction is applied where it is deserved. Under our form of legal inquiry the trier of fact (jury or judge) is the relevant knower and testimony constitutes the vast majority of the evidence that the legal fact-finder will rely upon. The natural starting place for an inquiry of this sort therefore involves us in the epistemology of testimony.

I sought, in Chapter 2, to provide a defensible epistemology of testimony that could serve as the basis for subsequent analysis. In a great many instances of testimony, if not most, the knower lacks evidence that would enable him or her to directly judge the veracity of the report. To overcome this difficulty I introduced a general principle based upon the notion of reporter credibility. Reporter credibility would be judged on the basis of the coherence and cohesiveness of the report with respect to a variety of 'topical beliefs' possessed by the knower. I then endorsed a reliabilist account as a theory of testimonial justification and incorporated the general principle into a standard reliabilist 'defeater clause.' At the close of Chapter 2, I noted that there are different contexts of justification that may shift the standard that we demand for justification. While a reliabilist theory of justification may be adequate for most contexts where we rely upon testimony as a source of knowledge, there are contexts where our epistemic priority rests

with error avoidance. In such contexts we demand something more akin to internalist justification: that knowers will possess reasons that justify their beliefs. Where testimony is the source of knowledge these reasons would consist in a positive assessment of reporter credibility rather than the mere absence of defeating evidence pertaining to reporter credibility. At the outset of Chapter 3, I argued that legal inquiry is one of these contexts where our priority rests with error avoidance, and I attempted to demonstrate how the trial process seeks to provide legal fact-finders with precisely this sort of basis for a positive assessment of reporter credibility.

The heightened justificatory requirements that characterize legal inquiry permit us to identify the problem that scientific testimony poses to inexpert courtroom determinations of fact. While the process of adversarial legal inquiry arguably performs adequately when applied to lay testimony, it begins to break down when lay knowers are called upon to evaluate expert testimony that they lack requisite background knowledge and experience to assess. In the latter part of Chapter 3, I examined the standard inclusionary approach to evidence, motivated by the 'requirement of total evidence' that underlies the legal rule of relevance that purports to address this deficiency through the adversarial presentation of evidence. Under this approach the examination and cross-examination of the expert, together with the presentation of conflicting expert opinion, is supposed to provide triers of fact with the background they require evaluating the science in question. This approach was found to be inadequate - both in that adversarial questioning cannot be expected to make up the ground in juror epistemic dependence, and in that the adversarial process can actually exacerbate the difficulties associated with scientific testimony.

The other standard legal response to evidence is to paternalistically seek to shield the legal fact-finder from evidence that may distort the fact-finding process. Under this exclusionary approach to evidence the epistemic dangers of scientific testimony are supposed to be mitigated by the application of a standard of admissibility that will ensure that only reliable testimony comes before the trier of fact. In Chapters 4 and 5, various real and recommended exclusionary approaches were examined under principled and efficiency based criteria. I argued that the tests examined all exposed shortcomings and discussed some of the principled difficulties associated with framing such a test. At the conclusion of Chapter 5, I argued that criteria that key directly upon reliability, rather than criteria that pick out surrogate indicators of reliability or features of supposed 'good science,' hold the best prospect for an adequate exclusionary standard.

In Chapter 6, I turned to an examination of the non-adversarial approach to scientific testimony that is motivated by continental procedures for dealing with expert evidence. This response, like the more traditional means of an exclusionary rule, seeks to mitigate potential distortion to the fact-finding process by ensuring that only reliable science goes before the trier of fact. Unlike the traditional means, this is accomplished by removing or limiting party control over the presentation of scientific evidence and instead relying upon the use of court-appointed independent experts. I examined Goldman's specific proposal that adopts this non-adversarial approach and attempts to adapt it to our adversarial model. The approach has the benefit of avoiding the troubling task of articulating an adequate judge-applied exclusionary rule; the selection of the independent expert is off-loaded to the scientific community itself as is the question of the reliability of the independent expert. By limiting the ability of the parties to challenge the

independent expert, either in questioning or through partisan experts, many of the difficulties associated with conflicting expert opinion are avoided. While Goldman's proposal offers some prospect of epistemic gain I nevertheless rejected it as a viable candidate. Significant departures from the adversarial model attract difficulty from a Constitutional standpoint as well as from the standpoint of the political morality that underlies our system of law. While there is something to be salvaged from this approach (the potential usefulness of independent experts), it represents too great a divergence from our legal tradition to be anything other than a subject for academic reflection.

The present chapter has sought to provide a response that incorporates the insights of the preceding inquiry into a procedure that, while remaining adversarial in character, nevertheless meets the epistemic and practical needs of the law. I have proposed a procedure that utilizes reliability based criteria, comparable to those articulated by Limpert, in a trial judge's assessment of the prejudicial effect versus probative value of scientific testimony under the existing *J.-L.J.* framework. To address the difficulties associated with such an assessment by an inexpert trial judge I introduced procedural means for the use of independent court-appointed experts as 'judge's aids.' I argued that this approach provides a more principled means of excluding unreliable science than competing exclusionary approaches. It thereby mitigates the dangers posed by the admission of unsound science, while ensuring a measure of judicial flexibility concerning the admission of testimony in cases where other non-epistemic values hold greater weight. Finally, I addressed some of the other concerns posed by scientific testimony, juror underevaluation of reliable science and the adversarial exploitation of scientific testimony, by invoking the professional responsibilities of the legal community.

Science is here to stay in our lives and in our courts. It is a powerful and complex tool that presents special challenges for our adversarial legal system, a system that in many respects is premised upon a resistance to authority and expertise. The challenge should not dissuade those of us who cherish the hope that is represented by a nation founded in laws that are in the service of justice. Justice demands truth and a respect for human dignity and liberty. We must therefore rise to the challenge and continue to strive for a system of laws and procedures that meets our veritistic, moral, and political aspirations.

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