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Reading the Judicial Mind: Predicting the Courts' Reaction to the Use of Neuroscientific Evidence for Lie Detection

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How will the courts react to the emerging technology of detecting deception using neuroscientific methods such as neuro-imaging? The sociological theory of the autonomy of technology suggests that if neuroscientific techniques come to be seen as reliable for this purpose, other objections will soon be abandoned. The history of the judicial reaction to DNA evidence illustrates this pattern. As DNA evidence came to be seen as highly reliable, the courts rapidly abandoned their concerns that juries would be overwhelmed by the "mystique of science" and that the justice system would be "dehumanized." The legal justifications for rejecting polygraph evidence are explored in order to illustrate that the judicial resistance to lie detection technologies, including neuro-imaging, can be expected to follow a similar pattern. The author argues that technologies that are widely accepted as reliable cannot be permitted to remain outside the justice system to deliver their own verdicts that are incompatible with those of the courts. The continued legitimacy of the justice system cannot tolerate this. The rules of evidence and, in particular, the constitutional right to make full answer and defense are the legal mechanisms by which this accommodation would take place.

Comment les tribunaux réagiront-ils face à la technologie émergente qui permet de détecter la supercherie à l'aide de méthodes neuroscientifiques comme la neuro-imagerie? La théorie sociologique d'autonomie de la technologie veut que si des techniques neuroscientifiques en viennent à être considérées comme étant fiables à cette fin, d'autres objections seront aussi, éventuellement, laissées de côté. L'expérience de la réaction du pouvoir judiciaire aux preuves provenant de l'analyse de l'ADN illustre bien ce cheminement. À mesure que la fiabilité de la preuve provenant de l'analyse de l'ADN s'avérait, les tribunaux ont mis de côté l'inquiétude que les jurés seraient dépassés par le côté mystérieux de la science et que le système de justice serait déshumanisé. Les motifs d'ordre juridique pour refuser la preuve polygraphique sont examinés pour expliquer que l'on peut s'attendre à ce que la résistance du pouvoir judiciaire face aux technologies de détection des mensonges, dont la neuro-imagerie, suive le même parcours. L'auteur plaide que les technologies dont la fiabilité est largement acceptée ne doivent pas rester étrangères au système de justice parce qu'elles rendent des verdicts incompatibles avec ceux des tribunaux. La légitimité du système de justice ne saurait le tolérer. Les règles de preuve, en particulier le droit constitutionnel à une défense pleine et entière, sont les mécanismes juridiques par lesquels cet accommodement serait accordé.

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Introduction

The objective of this paper is to examine how the courts might react to the emerging neuroscientific techniques for detecting deception. The application of neuroscience to lie detection is based on the observation that deception may be associated with particular patterns of brain activity that are manifested in local changes in blood oxygenation or with characteristic forms of electrical activity in the brain.

Lie detection is an important component of the judicial function in a trial, since the trier of fact (the jury, or the judge where it is a judge-alone trial) must ascertain what happened in the dispute by assessing evidence including the live testimony of witnesses. Over the years, courts have had to decide how to handle other lie detection technologies such as the polygraph (lie detector) test, or voice stress analysis. They have also had to decide when to accept expert evidence that is relevant to credibility such as the evidence of child psychologists about why children may recant allegations of abuse. While the courts have, on occasion, been willing to accept expert psychological evidence, they have generally rejected technologies such as the polygraph, which purports to detect deception directly by measuring physiological reactions.

The underlying reasons for the rejection of polygraph evidence by Canadian and American courts are essentially two-fold. In some cases, the evidence is said to be unreliable.[1] Second, the evidence is also sometimes said to be unnecessary and dangerous. The courts state that the evidence is unnecessary because human beings are eminently capable of assessing credibility, and it is dangerous because it might cause the trier of fact to abdicate the responsibility of determining credibility and merely to defer to the expert polygraph examiner. Sometimes this second objection is framed in emotionally laden language, such as that the use of the technological evidence would dehumanize the justice system and usurp the quintessentially human function of assessing credibility.

The belief that lie detection technologies are unnecessary is based on a presumption that human triers of fact are competent to perform this function unaided. In fact, the legal system is curiously ambivalent on this point. The courts often state that it is "axiomatic" that humans can and should perform the function of determining credibility. Furthermore, an appellate court is supposed to defer to a trial court's findings of fact because of the great advantage presumably held by the trial court in being able to observe witness demeanour while the appellate court has only dead transcripts to read. All of this suggests that the legal system is confident in the human ability to assess credibility. At the same time, however, the recommended instructions to juries warn jurors of the potential dangers of relying too heavily on demeanour to make determinations about credibility. The experimental evidence is quite consistent in suggesting that human beings on average do not do much better than chance in assessing credibility based on demeanour alone.[2] It is difficult to know whether this result can be generalized to the trial where other forms of information beyond demeanour are available to assist in assessing credibility. Nonetheless, there seem to be quite good reasons to be concerned with the quality of a trial court's credibility assessment procedures, particularly where there is little evidence other than demeanour available for assessing credibility.

In addition to the belief that lie detection technology is unnecessary because humans can assess credibility, the courts also defend what is

1. The term "reliable" is used throughout in the sense in which it is used in the legal context—i.e., reliable evidence is evidence that is worthy of being relied upon because it is sufficiently likely to correctly suggest the proposition for which it is put forward. In other contexts, "reliable" is sometimes meant to indicate that the same results can be expected from multiple measurements whether or not they are in fact accurate. This other meaning is not used in this paper.

2. See, e.g., Paul Ekman, Maureen O'Sullivan & Mark G. Frank, "A Few Can Catch a Liar" (1999) 10 Psych. Sci. 263 [Ekman, O'Sullivan & Frank]; Paul Ekman & Maureen O'Sullivan, "Who Can Catch a Liar?" (1991) 46 Am. Psych. 913 [Ekman & O'Sullivan]; Aldert Vrij *et al.*, "Detecting lies in young children, adolescents and adults" (2006) 20 Applied Cognitive Psychology 1225 [Vrij *et al.*].

sometimes called the "province" of the trier of fact. In other words, the courts regard credibility determination as falling within the role or function of the trier of fact, and defend it against "usurpation" by outside experts. They also express concern with the dehumanization of the justice system. Similar objections were raised in the early days of the use of DNA evidence for identification purposes.[3] However, within a few years the courts had reversed position and embraced DNA evidence. Can we learn anything about the future of lie detection technologies in the courts from this history given that both lie detection and DNA technologies faced similar objections related to the usurpation of the role of the trier of fact? There are some important differences between the two of course. DNA evidence became widely-accepted as reliable while lie detection technologies have not yet been accepted as such. Further, DNA evidence is used for identification rather than lie detection, and courts are accustomed to seeking assistance with identification whereas the court has only rarely accepted third party help with credibility assessment. As a result, the sense that the technology is usurping the function of the trier of fact is not as acute in the context of identification technologies as for lie detection technologies.

Nevertheless, the history of DNA evidence, which was initially resisted on similar grounds as are raised against the polygraph (and are likely to be raised against neuroscientific lie detection), suggests that once a technology can be clearly demonstrated to be reliable, it will be accepted notwithstanding competing concerns about dehumanization or usurpation of the human functions in a trial. This is consistent with the theory of autonomous technology, which is derived from the sociological, historical and philosophical studies of technology. This theory suggests that technology tends to resist or escape deliberate human control, instead re-shaping social values and behaviour to ensure the integration of the technology into the culture.

In previous work, I have suggested that there are patterns in our legal rules and procedures that are consistent with the theory of autonomous technology.[4] In particular, legal rules and methods tend to re-frame disputes in a way that assists in societal adaptation to, and incorporation of, novel technologies that are in dispute. This paper builds on this work, suggesting that the courts too are not immune to technological encroachment on their functions and procedures despite initial resistance.

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3. See, *R. v. Bourguignon*, [1991] O.J. No. 2670 (Ont. Gen. Div.), aff'd (1996) 118 C.C.C. (3d) 43 (Ont. C.A.) [*Bourguignon*].

4. Jennifer Chandler, "The Autonomy of Technology: Do courts control technology or do they just legitimize its social acceptance?" (2007) 27 Bulletin of Science, Technology & Society 339 [Chandler].

I suggest that the technological values of reliability and efficacy offer a durable base upon which a court may refuse to adopt neuroscientific lie detection, while the concerns about the dehumanization of the justice system and the usurpation of human roles will, it is predicted, be forgotten if neuroscientific lie detection is demonstrated to be highly reliable. The constitutional protection of the right to make full answer and defence to criminal charges, as well as the need to preserve the legitimacy of the justice system, will make it necessary to adopt a reliable lie detection technology particularly where the existing "human" method is shown to be deficient. Some may feel that this outcome is fine, and that we should adopt reliable technologies for lie detection if and when they develop. I do not address the desirability of this outcome, but instead focus on the way in which traditional values and commitments (such as the firm attachment to the idea that humans should assess credibility in the trial context) may give way to technological developments.

The paper will proceed as follows. Part I will describe the theory of autonomous technology, and its application to predicting the judicial reaction to neuroscientific lie detection. Part II will briefly outline the history and current status of lie detection technologies, including the emerging neuroscientific techniques. Part III explores the current non-technological approach to lie detection in the courts and the legal system's faith in the human ability to detect deception. Part IV reviews the legal rules that, it is argued, will apply if an accused person seeks to support his or her credibility using neuroscientific techniques. This last Part also concludes that the history of judicial reactions to other novel forms of scientific evidence suggest that the courts will accept neuroscientific lie detection evidence if and when it is shown to be reliable, notwithstanding concerns about the erosion of the traditional functions of the courts.

I. *The autonomy of technology*

Technology is a central feature of human ideology and activity, and it is closely tied to the characteristics of our existence in the world as well as the consequences of our existence for the world. Technology is understood here to refer to the diverse collection of tools, techniques and systems (both material and non-material) used by human beings to

achieve particular goals.[5] One of the central questions in the sociological study of technology has to do with the extent to which technology shapes societies, as well as human action and perception.[6] Technological determinism holds that technology is the central force in human history, determining the structure of the rest of society and culture.[7] In other words, "as technology develops and changes, the institutions in the rest of society change, as does the art and religion of the society."[8] Soft and hard variants of technological determinism leave more or less room for independent (i.e., non-technologically determined) social and cultural influences on the course of technological change.[9]

The thesis of the autonomy of technology is a related claim that technology seems somehow to resist or escape human control.[10] This is a curious idea, given that human beings appear freely to use or reject particular technologies. Nonetheless, there are various ways in which, as humans and societies, we may come to be obliged to adopt a given technology. Technologies may change the human environment in ways that necessitate their continued use. For example, the development of technologies such as motorized transportation or the Internet have led to patterns of urban development and culture that make the use of these technologies nearly essential for full participation in our society. The adoption of technologies may also be driven by human competition, as is illustrated by the history of warfare and the "arms race." The effect of the competitive pressure is also illustrated by the search for advantage in sport, both in terms of athletic equipment and pharmaceutical enhancement, and it also underlies concerns that the uptake of other human enhancement technologies is inevitable. At a more subtle level, technologies may also shift human

5. This is an admittedly broad definition. The selection of a definition for a particular inquiry must navigate between the poles of excessive narrowness and excessive breadth. Scholars involved in the study of technology as a phenomenon have struggled with a definition that usefully encapsulates the key features of technology without expanding to encompass virtually all human activity. In the end, I agree with writers such as Ellul and Winner that a real understanding of technological behaviour and activity requires a definition of technology that is broader than the various material tools humans have used from time to time, and also encompasses goal-oriented techniques and systems as well. See Langdon Winner, *Autonomous Technology: Technics-out-of-Control as a Theme in Political Thought* (Cambridge MA: MIT Press, 1977) [Winner].

6. Carl Mitcham & Katinka Waelbers, "Technology and Ethics: Overview" in Jan-Kyrre Olen, Stig Andur Pedersen & Vincent F. Hendricks, eds., *A Companion to the Philosophy of Technology* (Malden MA: Wiley-Blackwell, 2009) 367 at 371.

7. Merritt Roe Smith, "Technological Determinism in American Culture" in Merritt Roe Smith & Leo Marx, eds., *Does Technology Drive History? The Dilemma of Technological Determinism* (Cambridge MA: MIT Press, 2004) at 2 [Smith]; Val Dusek, *Philosophy of Technology: An Introduction* (Malden MA: Wiley-Blackwell, 2006) at 84 [Dusek].

8. Dusek, *ibid.* at 84.

9. Smith, *supra* note 7 at 2.

10. Winner, *supra* note 5 at 15; Dusek, *supra* note 7 at 84.

values and culture in a process that Winner calls "reverse adaptation."[11] In this process, human ends are adjusted to match technologies. Winner offers the example of techniques of measurement and evaluation which, rather than being "neutral, uninvolved sensing devices" instead may re-fashion the goals of the measured activity.[12] For example, standardized mass testing in education re-orients education toward the achievement of those kinds of skills that are readily testable through multiple-choice testing and away from skills, such as creative writing, that are less easily tested in this way.[13]

The idea of the autonomy of technology is familiar within the philosophy and sociology of technology, but it has been little explored in the legal context.[14] Yet, as one of the key mechanisms by which human control of technology might take place, the law is an important focus for the exploration of how and whether we are free to make choices about the adoption of novel technologies. The assumption that our laws and legal institutions are conduits for the expression of freely-chosen collective decisions to promote, regulate or ban certain technologies may be wrong. If the thesis of autonomous technology is correct, the law may instead tend systematically to support the social and cultural incorporation of efficient technologies.

In previous work, I have looked at judicial decisions involving advanced technologies to see if there is a pattern in which the law tends to resolve disputes in ways that ease the integration of the technology into the culture, rather than recognizing and permitting opposition to the technology.[15] In this previous work, I have suggested that one can discern such a pattern in our legal rules and concepts. In the course of this work, I began to wonder

11. Winner, *ibid.* at 238.

12. *Ibid.* at 234.

13. *Ibid.* at 235.

14. This is not to say that legal scholars have ignored the interaction between law and technology. Many legal scholars have noted the ways in which the law does or ought to affect technological innovation, and some have approached the prior question of whether the law *can* affect technological innovation, noting problems such as the way in which the law tends to lag behind scientific and technological innovation. However, the thesis of the autonomy of technology challenges, at a fundamental and less well-explored level, the ability of humans and human societies freely to use the law to adopt or reject new technologies.

15. Chandler, *supra* note 4. In this work I pointed to two examples. First, the doctrine of mitigation as applied in personal injury cases denies compensation to negligently injured plaintiffs who refuse certain forms of medical treatment. Second, the judicial framing of some disputes tends to make the effects of a technology invisible and to treat the harm of those who reject a technology as self-inflicted. For example, in a dispute having to do with the drift of genetically modified canola pollen onto the fields of organic farmers, the trial judge was receptive to the argument that the harm suffered by organic farmers flowed from their decision to adhere to organic certification standards that reject GM pollen rather than from the GM pollen itself.

whether this pattern would exist in cases where the technology challenged the legal system and judicial ideology directly, rather than involving the courts simply as arbiters of technological disputes in other areas of human activity. In other words, how would the courts react to a technological challenge to the traditions of the law or legal system itself? The present paper seeks to explore this question by looking at how courts have reacted to lie detection technologies, and, in particular, how they are likely to react to neuroscientific lie detection. Neuroscientific methods of lie detection would present a direct technological challenge to the cherished and well-guarded function of the trier of fact—credibility assessment.

If technology is autonomous, then we would expect to find the legal system to be structured in a way that would eventually adapt and absorb an effective novel technology, regardless of a clash with traditional legal custom and values. In the discussion that follows, I trace the judicial treatment of polygraph and DNA evidence in order to make the argument that misgivings about the "dehumanization" of the justice system and the usurpation of quintessentially human functions by machines will not prevent the adoption of effective novel technologies including neuroscientific techniques of lie detection (should they be shown to be reliable). Instead, we will become habituated to the artificiality or "unnaturalness" of the new methods, as we have become accustomed to a whole range of tools and techniques we have adopted through human history, and will cease to view them as problematic.

II. *Lie detection technologies*

The detection of deception has long been a preoccupation in human societies, and ancient societies have used various telltale physiological signs as clues to identify liars.[16] The human assessment of demeanour is also an important part of the determination of credibility in the modern trial context. The central role of demeanour assessment in determining credibility is underscored by the deference shown by appellate courts to trial courts on findings of fact. This deference is said to be justified by the fact that trial courts have the advantage of observing the demeanour of witnesses while the appellate court must rely on transcripts alone.

The invention of the polygraph machine in the early 20th century represents an attempt to make the process of physiological assessment more objective and reliable. The polygraph test measures a group of physiological responses that are sometimes associated with deceptive

16. Kerry Segrave, *Lie Detectors: A Social History* (Jefferson, NC: McFarland & Company, 2004) at 4.

behaviour including breathing rate, perspiration, heart rate and blood pressure.[17] The reliability of the polygraph test is uncertain and it is also potentially subject to countermeasures by examinees.[18]

More recently, various neuroscientific methods have been suggested as the next generation of lie detection technologies.[19] Two of the key technologies are functional magnetic resonance imaging (fMRI) and the so-called "brain fingerprint," which is a form of electroencephalography.

FMRI technology is able to distinguish the levels of blood oxygenation in different parts of the brain. Since metabolically active and inactive locations in the brain have different patterns of blood oxygenation, fMRI permits an investigator to infer patterns of brain activation from the fMRI images.[20] Recent studies have explored the use of fMRI for the detection of deception, and it has been suggested that there are different patterns of localized brain activation associated with deceptive and truthful responses to questioning.[21] Attempts are being made to commercialize fMRI for lie detection. Cephos Corp. and No Lie MRI, Inc. offer fMRI lie detection services to voluntary subjects who wish to demonstrate their truthfulness, and both companies aim to have their tests admitted as evidence in U.S. courts.[22]

The "brain fingerprint" relies on electroencephalography to pick up electrical activity within the brain. One electrical signal, known as P300, has been demonstrated to be elicited when a subject is presented with a meaningful stimulus.[23] The possible utility in the criminal context is that one might try to identify a perpetrator by testing for recognition of specific details related to the crime.[24] A key proponent of its use for

17. U.S. National Academy of Science, National Research Council, *The Polygraph and Lie Detection* (Washington: National Academies Press, 2003) online: National Academies Press <http://www.nap.edu/openbook.php?isbn=0309084369>, at 12-13, 213 [Nat. Acad. Sci.]; Henry T. Greely & Judy Illes, "Neuroscience-Based Lie Detection: The Urgent Need for Regulation" (2007) 33 Am. J. L. & Med., 377 [Greely & Illes].

18. Nat. Acad. Sci., *ibid.* at 214.

19. Greely & Illes, *supra* note 17 at 385.

20. Nat. Acad. Sci., *supra* note 17 at 2; *Ibid.* at 380.

21. Nat. Acad. Sci., *ibid.* at 159; Greely & Iles, *ibid.* at 394.

22. Cephos Corporation, "fMRI Testing and Legal Admissibility" online: <http://www.cephoscorp.com/lie-detection/index.php#admissibility>; Emily Murphy, "No Lie MRI being offered as evidence in court" *Stanford Center for Law & the Biosciences Blog* (14 March 2009) online: <http://lawandbiosciences.wordpress. com/2009/03/14/no-lie-mri-being-offered-as-evidence-in-court/>.

23. Ewout H. Meijer, Fren T.Y. Smulders & Ann Wolf, "The Contribution of Mere Recognition to the P300 Effect in a Concealed Information Test" (2009) 34 Applied Psychophysiology and Biofeedback 221.

24. *Ibid.* and Jinsun Hahm *et al.*, "Detection of Concealed Information: Combining a Virtual Mock Crime with a P300-based Guilty Knowledge Test" (2009) 12(3) CyberPsychology & Behavior 269 [Hahm *et al.*].

lie detection, Lawrence Farwell, is attempting to commercialize "brain fingerprinting."[25]

The reliability of these techniques for lie detection is currently disputed.[26] In the U.S., they have surfaced in only a handful of cases and there has not yet been a thorough judicial analysis of their reliability and admissibility.[27] There appears to have been a conviction for murder reached, in part, on the basis of a form of "brain fingerprint" in India.[28] The judge in the Indian case cited this evidence as proof that the accused had "experiential knowledge" about the crime that only the killer could possess.[29] In April 2009, she was released on bail pending appeal.[30] The bail order questions the guilty verdict on the basis of some inconsistencies in the evidence, but does not mention the brain fingerprint evidence.

III. *Credibility determination in court*

In a trial, the trier of fact (the jury, or the judge where it is a judge-alone trial) must ascertain what happened. This process of "finding the facts" involves the consideration of evidence presented by the parties. The parties may themselves testify, they may call other witnesses to testify and they may produce physical evidence such as objects or documents.

One key problem for the trier of fact is the credibility of testimony, and in some cases there may be little evidence available other than the competing accounts of the parties. Credibility determination is not just a matter of deciding whether a witness is lying or not. There are various reasons why a witness may not speak the truth. The witness may knowingly lie or mislead, the witness may have convinced him or

25. Brain Fingerprinting Laboratories, Inc., "Technology Overview" online: <http://www.brainwavescience.com/TechnologyOverview.php>.

26. Greely & Illes, *supra* note 17; Hahm *et al. supra* note 24 at 273; Emilio Bizzi *et al.*, *Using Imaging to Identify Deceit: Scientific and Ethical Questions*, (Cambridge: American Academy of Arts & Sciences, 2009).

27. Teneille Brown, "Request to admit No Lie MRI report in California case is withdrawn" *Stanford Center for Law & the Biosciences Blog* (25 March 2009), online: <http://lawandbiosciences.wordpress.com/2009/03/25/request-to-admit-no-lie-mri-report-in-california-case-is-withdrawn/>; *Lebron v. Sanders*, No. 02 Civ. 6327 (RPP), 2005 U.S. Dist. LEXIS 35588 (S.D.N.Y. Dec. 23 2005); Alexis Madrigal, "MRI Lie Detection to Get First Day in Court" *Wired.com* (16 March 2009), online: Wired Science <http://www.wired.com/wiredscience/2009/03/noliemri/>; *Slaughter v. State*, 2005 OK CR 2, (Okla. Cr. App. 2005); *State v. Harrington*, 659 N.W. 2d 509 (Iowa Sup. Ct. 2003).

28. Anand Giridharadas, "India's Novel Use of Brain Scans in Courts is Debated" *New York Times* (14 September 2008) AIO, online: The New York Times <http://www.nytimes.com/2008/09/15/world/asia/15brainscan.html/>.

29. *State of Maharashtra v. Sharma*, (2008), Sessions Case No. 508/07, (Court of Sessions, Pune District, India), at paras. 11, 97-118, online: *Stanford Center for Law & the Biosciences Blog* <http://lawandbiosciences.files.wordpress.com/2008/12/ beosruling2.pdf>.

30. *Sharma v. State of Maharashtra*, (2008), (Bail Order, Criminal Appellate Jurisdiction, High Court at Bombay, India), online: *Stanford Center for Law & the Biosciences Blog* <http://lawandbiosciences.files.wordpress.com/2009/04/iditis-bail-order1.pdf>.

herself of a set of untrue facts, or the witness may have defects in memory, understanding or perception that cause him or her to unknowingly provide untrue facts. Ascertaining the truth requires a fact finder to consider all of these possibilities. It is important to emphasize this point because even a perfect method of lie detection would not assure the truth of testimony, given the other possible sources of unreliability, although it may at least identify deliberate untruths.

Credibility assessment depends on two main sources of information.[31] First, the trier of fact will observe a witness's demeanour while testifying. Second, the trier of fact will consider the plausibility of the witness's statements in the context of the trier of fact's general knowledge about the world and human behaviour, and in the context of the rest of the evidence presented in the trial.

Turning first to credibility assessment based on demeanour, the experimental evidence suggests that people are generally rather poor at detecting deception when they must do so on the basis of demeanour alone.[32] On average, they score only a bit better than 50% accuracy in experimental settings.[33] Some people whose professional role requires them to detect liars do somewhat better than average (e.g., secret service members), but many such groups reflect roughly the same success rate in detecting deception in experimental settings as do ordinary people.[34] In two studies by Ekman *et al.*, judges appeared, on average, to be correct about 60% of the time.[35] The experiments of Vrij *et al.* suggest that members in a range of occupational groups achieve about 60% accuracy in detecting deception in children, adolescents and adults.[36]

There is also a risk that failures in assessing credibility might vary according to the culture or ethnicity of the witnesses and fact finders. Demeanour appears to be culturally sensitive so that finders of fact may misinterpret the respectful or embarrassed avoidance of eye contact as a

31. Randolph N. Jonakait, *The American Jury System* (New Haven, CT: Yale Univ. Press, 2003) at 56 [Jonakait].
32. Ekman & O'Sullivan (1991), *supra* note 2.
33. *Ibid.*; Joseph W. Rand, "The Demeanor Gap: Race, Lie Detection and the Jury" (2000) 33 Conn. L. Rev. 1 at 51-54 [Rand].
34. Ekman & O'Sullivan (1991), *ibid.*
35. *Ibid.*; Ekman, O'Sullivan & Frank (1999), *supra* note 2.
36. Vrij *et al.*, *supra* note 2.

sign of evasiveness.[37] As a result, there may be troubling systematic biases in the assessment of demeanour that may work against cultural or ethnic minorities in a society.

Although this experimental evidence is not reassuring, it is not clear whether it reflects the actual skill of judges and juries in assessing demeanour. The experiments are open to the criticism that the behaviour of the parties is likely to be affected by the artificiality of the setting.[38] Another objection is that experiments on demeanour assessment, even if they are very robust, may say little about real-world credibility assessment since people often make use of additional information beyond demeanour in assessing credibility.[39] Indeed, in the trial context, triers of fact are often able to use other evidence as well as their general knowledge about the world and human behaviour in order to assess the plausibility of a witness's testimony.

However, this last objection is weakened by the following observations. If these other sources of information are unavailable, ignored, or faulty in some way, a trier of fact's decision may be based on the seemingly shaky foundation of demeanour assessment. For example, where a trier of fact is uncertain or under time pressure, he or she may quickly make an intuitive judgment of credibility based on demeanour rather than on the more laborious and demanding process of carefully sifting the evidence for consistency.[40] In addition, the "general knowledge about the world and human behaviour" that a finder of fact uses in order to measure the plausibility of a witness's testimony may also be affected by pervasive myths and stereotypes about the behaviour of certain groups. Some courts have noted the risk that myths and stereotypes about the behaviour of complainants might affect the assessment of their credibility in sexual

37. F. Kaufman, *Report of the Kaufman Commission on Proceedings Involving Guy Paul Morin.* (Ontario: Publications Ontario, 1999) online: Ministry of the Attorney General <http://www.attorneygeneral.jus.gov.on.ca/english/about/pubs/morin/>. The Report mentions this problem at p. 1147:

> Mr. Brodeur also pointed out that demeanour is culturally sensitive. He cited the example of aboriginals in Australia. Non-aboriginal Australians can make hasty and erroneous interpretations of aboriginal behaviour. Aboriginal body language and behaviour is markedly different than that of non-aboriginals. Looking someone in the face, for instance, is a mark of disrespect to the former and a mark of truth to the latter. Mr. Brodeur stated that aboriginals very often lose custody of their children because judges misinterpret their (apparently evasive) behaviour in court.

See also Rand, *supra* note 33.

38. Jonakait, *supra* note 31.

39. Hee Sun Park *et al.*, "How People Really Detect Lies" (2002) 69 Communication Monographs 144.

40. *Ibid.*

assault cases,[41] and that racist stereotypes may also affect the assessment of an accused's credibility.[42]

In sum, it is difficult to assess the capacity of the trier of fact to identify deception in the real-world setting of a trial where multiple sources of information may be available. However, there are good reasons to be concerned that judgments of credibility based on demeanour alone are not particularly reliable, and that we cannot always depend upon the availability or robustness of other information such as third-party evidence or the general knowledge of the trier of fact. Nonetheless, the trier of fact will often be able to rely not just on demeanour in determining credibility but also on the content of a witness's statement, including the coherence, consistency and completeness of the story and the absence of plausible alternatives.

1. *Usurping the function of the trier of fact*

Given the foregoing, the confidence of the legal system in the human capacity to assess credibility based on demeanour is interesting. This confidence is demonstrated in many ways, such as in the deference of appellate courts to trial courts on findings of fact.[43] Although an appellate court will have the transcripts of testimony, it does not have the ability to observe the demeanour of the witnesses and so is considered to be less able to assess credibility.[44] The Canadian Supreme Court has written that,

> [i]t is, of course, true that the assessment of the credibility of a witness is more of an "art than a science" ... It is the highly individualistic nature of a determination of credibility, and its dependence on intangibles such as demeanour and the manner of testifying, that leads to the well-established principle that appellate courts will generally defer to the trial judge's factual findings, particularly those pertaining to credibility.[45]

The Supreme Court's use of the common turn of phrase "more of an art than a science" is meant to suggest that credibility determination is a messy, intuitive business that cannot be reduced to a clear set of rules. Why, then, are we so confident in the human ability to identify deception,

41. *R. v. Find*, 2001 SCC 32, [2001] 1 S.C.R. 863.
42. *R. v. Williams*, [1998] 1 S.C.R. 1128 at para. 28.
43. S. Casey Hill *et al.*, eds., *McWilliams' Canadian Criminal Evidence*, 4th ed. (Aurora: Canada Law Book, 2003) at s. 27:30.10 [*McWilliams'*].
44. The Ontario Court of Appeal noted in *R. v. Howe* (2005), 192 C.C.C. (3d) 480 at 488 that "[a]n appellate court must always bear in mind the significant advantage enjoyed by the trial judge when it comes to assessing credibility...[T]he trial judge doubtless paid careful attention not only to what was said, but to how it was said. A lifeless transcript of the testimony cannot possibly replicate the unfolding of the narrative at trial." Cited in *McWilliams'*, *ibid* at s. 27:30.10.
45. *R. v. S. (R.D.)*, [1997] 3 S.C.R. 484 at para. 128.

and what would happen if a technological approach based on neuroscience were demonstrably superior to this messy human art?

In addition to appellate deference to trial-level fact-finding, the rules of evidence also reflect a firm belief in the ability of the jury to assess credibility. As the Canadian Supreme Court said in rejecting polygraph evidence, "[i]t is a basic tenet of our legal system that judges and juries are capable of assessing credibility and reliability of evidence."[46] The courts defend this function of the trier of fact with a vigour that causes one to wonder about the deeper ideologies at work. The categorical assertion of the trier of fact's competence to assess credibility, despite experimental evidence to suggest that people are quite bad at certain aspects of credibility assessment (particularly assessing demeanour), seems more like an argument aimed at forestalling challenge than an objective assertion of fact. Furthermore, there is actual inconsistency in the legal system's approach to demeanour evidence. Although deference to the trial court's findings of fact is said to be based on the court's advantage in being able to observe demeanour, the legal system cautions juries about the dangers of relying on demeanour evidence. The Canadian Judicial Council's model jury instruction suggests that judges should tell juries the following:

> What was the witness's manner when he or she testified? Do not jump to conclusions, however, based entirely on how a witness has testified. Looks can be deceiving. Giving evidence in a trial is not a common experience for many witnesses. People react and appear differently. Witnesses come from different backgrounds. They have different abilities, values and life experiences. There are simply too many variables to make the manner in which a witness testifies the only or most important factor in your decision.[47]

Where the trier of fact is a judge rather than a jury, a similar note of caution can be detected. In *R. v. Hull*, the Court of Appeal overturned the trial judge, stating that her refusal to draw conclusions or inferences from demeanour was an error because "the trial judge focused improperly on the issue of demeanour in isolation and, as a result, overstated the cautions relating to the use of demeanour."[48] In other words, the trial judge must consider demeanour because it is presumed to be relevant to credibility, and yet, demeanour alone is too dangerous to use for this purpose.

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46. *R. v. Béland,* [1987] 2 S.C.R. 398 at para. 17 [*Béland*].
47. Canadian Judicial Council, "Assessment of Evidence" *Model Jury Instruction* (February 2004) s. 9.4 at para. 10, online: Canadian Judicial Council <http://www.cjc-ccm.gc.ca/english/lawyers_en.asp?selMenu=lawyers_pmf_generalprinciples_en.asp#4>. Cited in *McWilliams*, *supra* note 43 at s. 27:30:10.
48. *R. v. Hull* [2006] 70 W.C.B. (2d) 274 (C.A.) at para. 9.

Why is it that the courts staunchly defend credibility assessment as the "province of the jury," when there are reasons to be concerned about the trier of fact's ability to judge credibility? Second, how long would this defence hold in the face of solid evidence of a more reliable means of judging credibility? I believe that the answers to these questions primarily have to do with preserving the legitimacy of the judicial system by supporting the belief that it produces correct verdicts. George Fisher has suggested that the rise of the jury as a method of finding facts in a trial is explained by the need to preserve the appearance of accuracy, rather than the achievement of actual accuracy in assessing credibility.

> [A]lthough the jury does not guarantee accurate lie detecting, it does detect lies in a way that *appears* accurate, or at least in a way that hides the source of any inaccuracy from the public's gaze. By permitting the jury to resolve credibility conflicts in the black box of the jury room, the criminal justice system can present to the public an "answer"—a single verdict of guilty or not guilty—that resolves all questions of credibility in a way that is largely immune from challenge or review. By making the jury its lie detector, the system protects its own legitimacy.[49]

Despite our modern faith in the jury as fact-finder, Fisher explains that we only relatively recently accepted that jurors have the capacity to determine contests of credibility in criminal trials.[50] Before the jury was entrusted with settling these conflicts, the system relied on the oath to justify a belief in a witness's truthfulness, and the system carefully avoided the embarrassment of conflicting oaths by limiting for a long while an accused's ability to testify under oath or to call sworn witnesses.[51] Fisher concludes that the gradual rise of the jury to the point where we confidently presume its competence to assess credibility despite evidence to the contrary can be explained by the problem of maintaining the legitimacy of the legal system.

> The inexorable flow of fact finding power to the jury was due, finally, to the jury's capacity to erase all blemishes...The jury's hidden decision-making process and its one- or two-word verdicts leave all mistakes and causes for criticism locked in the black box of the jury room.[52]

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49. George Fisher, "The Jury's Rise as Lie Detector" (1997) 107 Yale L. J. 575 at 578-579.
50. *Ibid.* at 579.
51. *Ibid.* at 583. Fisher notes that "by staking its verdicts on the oaths of witnesses, the justice system found it could claim that the threat of divine vengeance assured truthful outcomes. Rules that permitted only the prosecution to call witnesses helped, in turn, to protect the legitimacy of the oath by guarding against the embarrassment of conflicting oaths." See also *ibid.* at 704.
52. *Ibid.* at 706.

However, if a technology arises that can challenge these "black box" determinations of credibility, the justice system will have to accept the technology notwithstanding concerns about the dehumanization of the justice system or the erosion of the province of the jury. As will be discussed further below, the rapid shift in how the legal system reacted to DNA evidence, moving swiftly from a concern that it would dehumanize the justice system to the position that it is critical evidence, illustrates this point. DNA technology has reached a degree of acceptance that it can successfully claim to be able to reveal miscarriages of justice and so must be integrated into the trial process. Lie detection technologies on the other hand are currently undeveloped and unproven. If neuroscientific technologies come to be viewed as reliable for lie detection, however, I suspect that the legal rules governing the admissibility of evidence would permit them to be admitted in court, notwithstanding the attachment to the idea that credibility determination is a human function.

IV. *The legal rules applicable to the admissibility of neuroscientific evidence for lie detection*

In a criminal prosecution, both the accused and the prosecution may be interested in adducing neuroscientific evidence. They may wish to use it to demonstrate the truthfulness of one of their own witnesses, or they may wish to challenge the truthfulness of a witness for the other side. A party wishing to do so will need to introduce this evidence through an expert witness who can interpret it for the court. The laws of evidence dealing with the admissibility of novel scientific evidence and expert evidence will apply to determine whether this information is admissible in a trial. Although neuroscientific evidence such as neuro-imaging has been admitted for some purposes, such as showing damage to brain structures, its use for lie detection is novel in the legal context and so it will be scrutinized under the rules applicable to novel scientific evidence.

In addition to the rules of evidence, constitutional human rights guarantees are relevant. If the state seeks to obtain and use neuroscientific evidence against an accused person, constitutional provisions related to the privilege against self-incrimination and the freedom from unreasonable search and seizure will be relevant.[53] On the other hand, if the accused's request to adduce neuroscientific evidence is refused, the constitutional protection of the right to make full answer and defence will be at issue.

53. *Canadian Charter of Rights and Freedoms*, Part I of the *Constitution Act, 1982*, being Schedule B to the *Canada Act 1982* (U.K.), 1982, c. 11, s. 11(c) and 8.

In the following discussion, I will draw upon the way the courts have reacted to two forms of scientific evidence, namely the polygraph and DNA evidence, to trace how the rules of evidence and constitutional protections are likely to apply where an accused person seeks to introduce exculpatory neuroscientific evidence for lie detection. The story that will emerge is that this evidence is unlikely to be admissible for this purpose at the moment because it has not been demonstrated to be sufficiently reliable. However, a review of the courts' reasoning in the polygraph and DNA cases suggests that reliability, rather than other often-stated concerns about the dehumanization of the justice system will be the fundamental reason to reject neuroscientific lie detection at present. Should that evidence become reliable, it is likely to be accepted notwithstanding concerns about dehumanization and the defense of the human function of assessing credibility in trials.

1. *Expert evidence, novel scientific evidence and lie detection technologies*

It makes sense to look at the judicial reactions to the polygraph test in seeking to predict how neuroscientific lie detection will be handled given that both are intended to provide evidence of veracity or deception. The Supreme Court of Canada rejected polygraph evidence in a split 3:2 decision in *R. v. Béland*.[54] The general structure of the applicable rules of evidence can be summarized as a set of four conditions of admissibility drawn from the rules on expert evidence and one additional condition drawn from the rules on novel scientific evidence. I outline these in the next paragraph, after which I go on to discuss their application in the context of lie detection technologies.

The courts restrict the admissibility of expert evidence in order to ensure that the expert opinion will be reliable and useful *and* to reduce the risk that the expert will "take over" the fact-finding function from the judge or jury. In order to achieve these objectives, courts admit expert evidence only if (1) the evidence is relevant to an issue in the case; (2) the evidence is necessary to assist the trier of fact; (3) the evidence does not violate an exclusionary rule of evidence; and (4) the witness is a properly qualified expert.[55] If the expert is to give evidence that constitutes "novel scientific evidence" the courts also demand that the evidence pass a threshold of

54. *Béland*, supra note 46. *Béland* predated the cases of *R. v. Mohan*, [1994] 2 S.C.R. 9 [*Mohan*] and *R. v. J.-L.J.*, 2000 SCC 51, [2000] 2 S.C.R. 600 [*J.-L.J.*], which provided the more modern articulation of the rules of evidence pertaining to experts and novel scientific evidence. However, the same types of considerations as were raised in *Béland* would also arise under the more modern approach.

55. *Mohan*, *ibid.* and *J.-L.J.*, *ibid.*

reliability. The key concerns underlying the restrictions on admitting novel scientific evidence are that the trier of fact may be overawed by the "mystique of science"[56] and may simply defer uncritically to scientific evidence. As the Canadian Supreme Court has put it, there is a risk that a jury might accept scientific evidence as "virtually infallible and as having more weight than it deserves" when "[d]ressed up in scientific language which the jury does not easily understand and submitted through a witness of impressive antecedents."[57]

Starting first with the condition of relevance, the Canadian courts have stated that there are two considerations to address. First, the evidence must be logically relevant, meaning that it must have some tendency to make the proposition for which it is advanced more likely than it would be in the absence of the evidence. Second, the Supreme Court has built a cost-benefit analysis into the relevance inquiry. In other words, relevance (as the court defines it) also requires that the value of the evidence to the trial process be greater than its costs in terms of the impact on the trial process.[58]

It is at this second stage that one might expect objections to neuroscientific lie detection. Past cases have pointed to such harms to the trial process as the inordinate consumption of time, prejudice, confusion, and distortion of the fact-finding purpose resulting from undue weight being given by the jury to evidence "cloaked under the mystique of science."[59] Another concern related to expert testimony is that expert evidence is "highly resistant to effective cross-examination by counsel who are not experts" and so the trier of fact will have trouble assessing expert evidence if there is no competing expert evidence.[60] In addition, expert evidence is time-consuming and expensive, and the proliferation of expert evidence imposes costs that strain both the parties' and judicial resources.[61] Several of these concerns (particularly those related to the "mystique of science") were raised against the polygraph and might well be raised against neuroscientific lie detection. As will be seen below, however, this fear is a flimsy reason to reject scientific evidence. It was quickly discarded in the context of DNA evidence, and has been rejected by a majority of the U.S.

56. The Supreme Court of Canada referred to "evidence cloaked under the mystique of science" in the polygraph context in *Béland, supra* note 46 at paras. 20, 58, and the Ontario Court of Appeal warned of the "mystic infallibility" of science in the DNA context in *R. v. Terceira* (1998), 38 O.,R. (3d) 175 (C.A.) at para. 55 [*Terceira*] (aff'd [1999] 3 S.C.R. 866).

57. *Mohan, supra* note 54 at 21.

58. *Ibid.* at para. 18.

59. *Béland, supra* note 46 at 434, cited in *J.-L.J., supra* note 54 at para. 55.

60. *R. v. D.D.*, 2000 SCC 43, [2000] 2 S.C.R. 275 at para. 54 [*D.D.*].

61. *Ibid.* at para. 56.

Supreme Court as demeaning of the jury's competence in the polygraph context.[62]

The second condition of admissibility is that the expert evidence be necessary to assist the trier of fact[63] rather than merely helpful to the trier of fact.[64] Put another way, the expert must provide information that is likely to be outside the experience or knowledge of the trier of fact and that is needed to enable the trier of fact to appreciate the matters in issue and form a correct judgment about them.[65]

Expert evidence to support credibility is thought to be unnecessary because triers of fact are considered to have the capacity to assess credibility and reliability. The courts also express the fear that because the determination of credibility is difficult, triers of fact are particularly vulnerable to simply deferring to the experts on this point if they are permitted to hear expert evidence on credibility.[66] In rejecting polygraph evidence, the majority of the Supreme Court of Canada stated that the sole issue addressed by the polygraph is credibility, that "[i]t is a basic tenet of our legal system that judges and juries are capable of assessing credibility and reliability of evidence," and that "no expert evidence is required" on this point.[67]

The faith of the legal system in the capacity of the trier of fact to assess credibility, and the need to preserve that function from usurpation by experts, surfaces repeatedly as the rules of evidence are applied to determine the admissibility of evidence on credibility. As noted above, these concerns formed part of the reasoning about whether the evidence was relevant, they arise again in the context of necessity, and will be seen again further below in the discussion of the exclusionary rules. Strangely, this emphatic confidence in the capacity of the trier of fact is belied both by other practices in the legal system (such as model jury instructions warning of the frailty of demeanour assessment and judicial statements about the risk of cross-cultural misunderstanding in demeanour assessment) as well as by outside experimental evidence as was noted above in Part III. It is also worth noting that the courts do in fact accept expert evidence related to credibility in other situations. Expert psychological evidence is admissible in situations where triers of fact commonly make erroneous assumptions regarding credibility, such as that a child's recantation of a sexual assault

62. *United States v. Scheffer*, 523 U.S. 303 (1998) [*Scheffer*].
63. *Mohan, supra* note 54 at para. 22.
64. *J.-L.J., supra* note 54 at para. 56.
65. *Ibid.* at paras. 30-31.
66. *R. v. Marquard*, [1993] 4 S.C.R. 223 at para. 49 [*Marquard*]; *D.D., supra* note 60 at para. 53.
67. *Béland, supra* note 46 at para. 17.

allegation necessarily indicates that the assault did not happen.[68] On this point, the courts make a fine distinction, requiring the expert to speak about the often-misunderstood behaviour in general without opining on whether the particular witness is or is not telling the truth.[69]

In light of these reasons to question the ability of the trier of fact to detect deception, it seems reasonably arguable that *reliable* neuroscientific evidence may well be necessary in some cases to assist with credibility assessment in the sense that the average person may well come to an incorrect judgment without it. The strength of this argument will likely vary according to the case, as people are probably more apt to make errors where credibility assessment is based mostly or entirely on demeanour alone.

The third condition of admissibility of expert evidence is that the evidence not offend one of the exclusionary rules of evidence. Evidence law contains a series of exclusionary rules, of which a number have been raised to exclude polygraph evidence. The same exclusionary rules are likely to arise with neuroscientific lie detection. A discussion of the following exclusionary rules follows: the rule against oath-helping, the rule against prior consistent statements, and the rules regarding character evidence.

The traditional rule against "oath-helping" prevents a party from presenting evidence the sole purpose of which is to bolster the credibility of that party's own witness.[70] The majority of the Canadian Supreme Court wrote in *Béland* that polygraph evidence has no purpose other than to bolster credibility and so offends this rule.[71] A closer examination of the underlying rationale for the rule against oath-helping reveals it to offer only a shaky reason to reject evidence from lie detection technologies.

Three sets of justifications are at the root of the rule against oath-helping.[72] First, the determination of credibility is within the province of the trier of fact, and oath-helping invades that province. Implicit in this

68. David M. Paciocco & Lee Stuesser, *The Law of Evidence*, 4th ed. (Toronto: Irwin Law, 2005) at 179 [Paciocco & Stuesser].

69. As the Ontario Court of Appeal put it in *R. v. Llorenz* (2000), 145 C.C.C. (3d) 535 (Ont. C.A.) at para. 28: "The line to be drawn when evidence is considered to be oath-helping is not always clear. There is a distinction to be made between (1) evidence about credibility (i.e. in my opinion the witness is truthful), which is inadmissible and (2) evidence about a feature of the witness's behaviour or testimony, which may be admissible even though it will likely have some bearing on the trier of fact's ultimate determination of the question of credibility."

70. *Béland, supra* note 46 at para. 7; *McWilliams'*, *supra* note 43 at s. 18:40; Paciocco & Stuesser, *supra* note 68 at 177.

71. *Béland, supra* note 46 at para. 9.

72. Paciocco & Stuesser, *supra* note 68 at 177; *Béland, ibid.* at para. 7; *McWilliams'*, *supra* note 43 at s. 11:20:50.

justification are the premises that the trier of fact is capable of determining credibility and is the only acceptable means by which credibility should be determined.[73] As noted above, this assumption that the trier of fact is capable of determining credibility seems shaky. The second justification for the rule against oath-helping is that the admission of oath-helping evidence would complicate trials and create distracting side-issues for the trier of fact. In *Béland*, the majority was worried that admitting oath-helping evidence such as the polygraph would distract the court from the main issues toward a debate over the interpretation of the polygraph or to a battle between competing polygraph experts.[74] While the admission of technological lie detection evidence would probably cause this type of problem, this must be balanced against the improvements to the process that reliable evidence might provide. The *Béland* majority clearly had this balancing in mind in saying that "there is no reason why the rules of evidence should not be modified where improvement will result ... [but the polygraph] will disrupt proceedings, cause delays, and lead to numerous complications which will result in no greater degree of certainty in the process than that which already exists."[75] Third, it is sometimes said that the common law presumes witnesses to be truthful until their veracity is questioned and so oath-helping is unnecessary.[76] This last point is a doubtful justification for the rule against oath-helping given that accused persons, accomplices and women in sexual assault cases are commonly stereotyped as untruthful.[77]

The rule against prior consistent statements was also invoked to exclude polygraph evidence in *R. v. Béland*. This rule states that, in a criminal trial, it is generally inadmissible to support a witness's credibility by showing that the witness made prior statements to the same effect.[78] A series of justifications are often suggested for this rule, including that such self-serving evidence is easily fabricated,[79] that repetition is irrelevant to whether a statement is truthful,[80] and that the admission of prior consistent statements will just consume time and complicate the trial.[81]

73. *Marquard, supra* note 66 at para. 49.
74. *Béland,* supra note 46 at para. 20.
75. *Ibid.* at para. 19.
76. *McWilliams', supra* note 43 at s. 11:20.50.
77. *Ibid.*
78. *R. v. Stirling*, 2008 SCC 10, [2008] 1 S.C.R. 272 at para. 5; Paciocco & Stuesser, *supra* note 68 at 445; *McWilliams', supra* note 43 at s. 11:10.
79. *McWilliams', ibid.* at s. 11:20:30; *Béland, supra* note 46 at para. 10.
80. *Stirling, supra* note 78 at para. 7; *McWilliams', ibid.* at s. 11:20.10.
81. *McWilliams', ibid.* at s. 11:20.40.

In *Béland,* the majority of the Canadian Supreme Court viewed evidence of the accused's statements during the polygraph test as nothing more than a repetition of statements that the accused made again during the trial. As a result, these were useless since repetition does not imply the statements are true.[82] The dissenting judges, correctly in my view, pointed out that polygraph evidence is not just a repetition of statements that the accused makes at trial. Instead, it constitutes expert evidence on whether a person's physiological responses when making a particular statement corresponded with those of someone telling the truth.[83] This is evidence that goes beyond merely showing a person said a similar thing on other occasions. As a result, this ground for excluding lie detection evidence ought not to apply.

However, repetitiveness was not the only ground upon which the majority applied the rule against prior consistent statements to polygraph evidence in *Béland.* The majority also stated that it was too easy for the accused to fabricate favourable evidence since the accused could take the test as many times as needed to get the desired result.[84] The dissenting judges were not persuaded by these arguments and felt that the concern about manipulation of the results should affect the weight to be given to the evidence rather than its admissibility.[85] Whether or not this concern will be a weighty one in the context of neuroscientific lie detection depends upon whether those results can be manipulated—an issue that once again boils down to an issue of reliability.

The third set of exclusionary rules applied by the *Béland* majority to exclude polygraph evidence were the rules regarding character evidence. While a person's character is considered relevant to credibility,[86] the law of evidence restricts the introduction of character evidence in order to prevent the undue consumption of time. The concern is that if an accused person calls a plethora of witnesses each of whom seeks to testify as to particular incidents demonstrating the accused's good character, there would need to be a mini-trial to assess each incident.[87] As a result, the rules of evidence prevent witnesses from testifying as to specific instances of good conduct, and allow them to testify only as to the accused's general reputation in the community.[88]

82. *Béland, supra* note 46 at para. 10.
83. *Ibid.* at para. 32.
84. *Ibid.* at para. 11.
85. *Ibid.* at para. 33.
86. *McWilliams', supra* note 43 at s. 9:20.20; Paciocco & Stuesser, *supra* note 68 at 443.
87. Paciocco & Stuesser, *ibid.* at 79; *Béland, supra* note 46 at para. 7.
88. *McWilliams', supra* note 43 at s. 9:40.10.

The majority in *Béland* held that a polygraph expert could not testify regarding an accused's performance in a polygraph test because this amounted to evidence regarding a specific incident rather than the accused's general reputation in the community.[89] The dissenting judges, on the other hand, questioned whether polygraph evidence was really a form of character evidence. The difficulty with the majority's reasoning is that polygraph evidence is not primarily meant to prove good character.[90] Instead, it is meant to demonstrate that a specific statement was truthful when it was uttered, regardless of the general honesty or other character traits of the accused. As for the concern that trial time will be consumed with disputes over the good deeds of the accused if evidence of specific good deeds is admitted, the problem is much more constrained in the case of lie detection technologies. In order to prove an accused has a generally truthful character, it may well be necessary to demonstrate as many instances of truthfulness as possible—raising a concern about time-consuming disputes over whether the various instances of truthfulness occurred and whether they reliably point to a generally truthful character. In the case of lie detection evidence, the evidence is meant to establish directly a specific instance of truthfulness rather than the general character trait of truthfulness. It is indeed possible that the lie detection evidence itself might be disputed, but this is a more restricted problem than that of a general review of all of the accused's instances of truthful behaviour, which might indeed consume a lot of time. As a result, there are reasonable grounds to question the rejection of polygraph evidence on this basis, and by extension to question whether character evidence rules must necessarily lead to the rejection of neuroscientific lie detection.

In sum, the *Béland* majority rejected polygraph evidence in Canada on the basis that it was not only unnecessary since the trier of fact was capable of assessing credibility, but it was risky because the trier of fact may defer to the expert polygrapher due to the "mystique of science." In addition, in the majority's view, polygraph evidence violated the exclusionary rules of evidence dealing with oath-helping, prior consistent statements, and character evidence. The foregoing discussion has suggested that these arguments are somewhat weak in light of evidence of the generally poor human capacity to detect deception as well as in light of a closer examination of the fundamental rationales for the exclusionary rules.

That being said, the rules for the admission of "novel scientific evidence" do present a more robust bar to the admission of polygraph

89. *Béland, supra* note 46 at para. 14.
90. *Ibid.* at paras. 34-36.

evidence as well as neuroscientific evidence for lie detection. In order to be admissible, novel scientific evidence must meet a threshold of reliability. The Canadian Supreme Court has stated that the criteria for determining if novel scientific evidence meets the basic threshold test of reliability are (1) whether the theory or technique can be and has been tested, (2) whether the theory or technique has been subjected to peer review and publication, (3) the known or potential rate of error, or the existence of standards, and (4) whether the theory or technique has been generally accepted.[91] These criteria are similar to those set out by the U.S. Supreme Court for the same purpose in *Daubert v. Merrell Dow Pharmaceuticals Inc.*[92]

The *Béland* majority made no finding on the reliability of the polygraph, stating it had not been provided with sufficient evidence on this point.[93] As noted above, they rejected polygraph evidence on the basis it was unnecessary, and that it violated various exclusionary rules of evidence. Most but not all American jurisdictions consider polygraph evidence not to meet the reliability standard for admissibility.[94] The 1923 American decision in *Frye v. United States*[95] rejected polygraph evidence on the ground that it had not yet become "sufficiently established to have gained general acceptance in the particular field in which it belongs."

The more recent decision of the U.S. Supreme Court in *U.S. v. Scheffer* dealt with the accused's constitutional challenge to the Military Rules of Evidence, and declared polygraph evidence inadmissible.[96] The majority decision was split among three judgments, with the result that the only shared basis for the rejection of the polygraph evidence was its lack of reliability.[97] Four of the nine judges also justified their decision on grounds that are familiar from the Canadian *Béland* decision, namely, the need to preserve "the jury's core function of making credibility determinations in criminal trials" and the need to avoid lengthy litigation over collateral issues.[98] The other five judges expressly rejected these additional reasons to reject the polygraph evidence, stating that the jurors were able to handle

91. *J.-L.J., supra* note 54 at para. 33.
92. *Daubert v. Merrell Dow Pharmaceuticals Inc.*, 509 U.S. 579 (1993).
93. *Béland, supra* note 46 at para. 19.
94. Greely & Illes, *supra* note 17.
95. *Frye v. United States*, 293 F. 1013 (D.C. Cir. 1923).
96. *Scheffer, supra* note 62.
97. *Ibid.* at 309-312. This lack of reliability was the common ground of justification for rejecting polygraph evidence for eight of the nine judges. One of the nine judges dissented, arguing that polygraph testing was reliable enough to survive a *per se* ban on admissibility.
98. *Ibid.* at 312-315. Collateral issues might include things such as the qualifications of the polygraph examiner or whether the test and control questions were appropriate.

the polygraph evidence and that the majority's concerns demeaned their competence.[99]

It is quite interesting that five of the nine judges in *Scheffer* were unconcerned with the kinds of concerns that swayed the majority in *Béland.* The concerns of the *Béland* majority were couched in the language of evidence law and exclusionary rules but fundamentally had to do with (1) a firm commitment to the idea that credibility determination is a matter for human triers of fact and that technological assistance ought not to be permitted to displace the trier of the fact, (2) a concern that polygraph evidence would raise confusing and distracting side-issues that would consume judicial resources for no good purpose, and (3) a doubt about reliability as manifested in the idea that an accused could retake the test as many times as needed to get a favourable result. It is unclear how the *Béland* judges would have ruled had they been given sufficient evidence on reliability to be able to reject the polygraph on that basis. Perhaps the majority of the Supreme Court of Canada too, like the majority of the U.S. Supreme Court, would have preferred to rule solely on the basis of reliability.

In any event, in these two cases, we see energetic criticisms from a minority of judges in *Béland* and a majority of judges in *Scheffer* of the reasoning that the polygraph must be rejected because judgments of credibility must be preserved as a core function of human triers of fact and that the triers of fact are likely to be overawed by the "mystique of science."[100] The point for the purposes of the present argument is that while reliability appears to be a solid reason for rejecting the polygraph, these other arguments about dehumanization and the traditional purview of the trier of fact are much less solid. This story is also demonstrated in a different context in the history of how DNA evidence came to be accepted in the courts.

2. *DNA evidence*

The recent history of the reception of DNA evidence provides another example of the incorporation of novel scientific evidence into judicial procedures. A possible preliminary objection is that DNA evidence offers an imperfect model to use in predicting the courts' reactions to neuroscientific lie detection because there are good reasons to expect that courts will have different reactions to the two technologies. DNA evidence is used for identification rather than for credibility determination. Since

99. *Ibid.* at 318-319.

100. *Ibid.*; *Béland, supra* note 46 at para. 39.

the courts are used to accepting the help of witnesses (including expert witnesses such as fingerprint experts) with identification, the reflex to reject technological evidence as invading the province of the trier of fact is not present with DNA as it appears to be with lie detection technologies. Despite this objection, I think the example of DNA evidence is still useful. It demonstrates the power of reliability to overcome objections about dehumanization and the "mystique of science," which have also been raised against the polygraph and, it seems likely, would be raised against neuroscientific lie detection.

DNA evidence is based on a match between the accused's DNA and that found at the scene of the crime and an estimated likelihood that such a match might occur randomly. The estimate is essential in assessing the significance of the match in DNA sequences. DNA evidence was first introduced in Canada in the late 1980s, and the probability estimates were soon challenged on the basis of accuracy and on the basis of the effect of the "mystic infallibility" of science on the jury.[101] The fear that juries would be overwhelmed by the statistics led courts to refuse to admit numerical statements about the likelihood of random matches (although phrases such as "rare" were allowed).[102] As one court put it,

> There is a real danger that the jury will use the evidence as a measure of the probability of the accused's guilt or innocence and thereby undermine the presumption of innocence and erode the value served by the reasonable doubt standard. As said in the *Schwartz* case: "[it would] dehumanize our justice system."[103]

The refusal to admit numerical statistics began to waver in the 1990s and, in 1997, one trial judge stated that "if the jury is denied the statistics, they would be denied part of the DNA evidence."[104] In the 1997 case of *R. v. Terceira* the Ontario Court of Appeal considered the concern that the jurors would be overcome by the "mystic infallibility" of DNA evidence.[105] The Court rejected the idea of using terms such as "rare, unlikely and remote" instead of the statistical numbers because these terms were "awkward" and unable "to convey the potency of a match."[106]

101. Trevor R. McDonald, "Genetic Justice: DNA Evidence and the Criminal Law in Canada" (1998) 26 Man. L. J. 1; Neil Gerlach, *The Genetic Imaginary: DNA in the Canadian Criminal Justice System* (Toronto: University of Toronto Press, 2004) at 41-43 [Gerlach].

102. *Bourguignon, supra* note 3.

103. *Ibid.*

104. *R. v. Henson* [1997] O.J. No. 5585 (Ont. Gen. Div.) at para. 39.

105. *Terceira, supra* note 56 at para. 55.

106. *Ibid.* at para. 58.

The strong language about dehumanization that is used in *Bourguignon* suggests that a deeper objection was at work beyond the concern that the jury would be unduly deferential to the DNA evidence. In that case, the Court quoted from a U.S. case which in turn drew the idea of dehumanization of the justice system from Laurence Tribe's article "Trial by Mathematics."[107] Tribe suggests that "much of the contemporary opposition to the technological emphasis upon rationality and technique" rests on the idea that it is "dehumanizing" to talk in highly abstract or quantitative terms about certain subjects such as justice.[108] On the other hand, Tribe suggests that mathematical tools are attractive because of "the lure of objectivity and precision."[109] Tribe's language echoes that of Jacques Ellul, in his sociological study of technology.[110] Ellul predicted that the technological mindset would ensure that the values of rationality and efficiency would necessarily overcome any competing attachment to customary values. In his article, Tribe argues that the lawsuit is not just about a search for historical truth, but it is also, and in his view, equally importantly, a ritual of conflict settlement.[111] He views the admittedly flawed human elements of the ritual as essential and argues that they are preferable to the alienating and intimidating prospect of an inscrutable "trial by mathematics."[112] Tribe's plea can be understood as a plea that is essentially the same as that of judges defending against the "dehumanization" of the justice system by the polygraph machine or by DNA technology.

The DNA cases show how quickly this type of concern about the dehumanization of the justice system can evaporate. Put another way, they illustrate how quickly we become habituated to the latest technological tool. Over fewer than ten years, DNA technology and its associated statistical analysis moved from being a form of evidence that would "dehumanize the justice system" to a tool that must be embraced because of the "potency of a match."

Part of the reason for this rapid shift may be that DNA technology quickly acquired the power to challenge the legitimacy of the justice system. Once DNA came to be accepted as a highly accurate and precise identification technology, it was available to challenge prior convictions

107. Laurence Tribe, "Trial by Mathematics: Precision and Ritual in the Legal Process" (1971) 84 Harv. L. Rev. 1329 [Tribe].
108. *Ibid.* at 1331.
109. *Ibid.* at 1331-1332.
110. Jacques Ellul, *The Technological Society*, (trans. by John Wilkinson) (New York: Vintage, 1964).
111. Tribe, *supra* note 107 at 1376.
112. *Ibid.* at 1376-1377.

in a way that would be intolerable for the continued credibility of the justice system. How could convictions stand where widely-trusted DNA evidence exonerated the convicted prisoner? Speaking about a high profile Canadian wrongful conviction case, Gerlach writes that,

> [t]he press coverage ... brought DNA testing into the Morin narrative as a heroic ultimate identifier – an objective truth teller that cut through the inefficient and ineffective rituals of testimony, witnessing, and organizational process to reveal the truth...DNA tests were being presented as a liberating factor and their accuracy as unquestionable – as the objective remedy to the subjective biases of the system.[113]

Gerlach quotes Guy Paul Morin as saying "[t]he justice system failed me, but science saved me...My lawyers did the best they could through the avenues of the justice system. But in the end, science gave the final word. Science is wonderful. I love science."[114]

This pattern of initial suspicion and resistance, framed as a concern about the "mystic infallibility" or "mystique" of science, or as concern about the dehumanization of justice is thus demonstrated both in the context of DNA evidence as well as with lie detection technologies. The majority decision in *Béland* justified the rejection of polygraph evidence in part on the risk that the trier of fact would be overawed by the "mystique of science."[115] However, this view is fragile and apt to ebb away with time. The minority in *Béland* rejected this concern, suggesting that juries "are not today in awe of scientific evidence as they might have been a hundred or even fifty years ago"[116] and would be able to consider polygraph evidence along with all the other evidence in determining credibility. The *Scheffer* court suggested that the "fear that the average jury is not able to assess the weight of [the polygraph testimony] reflects a distressing lack of confidence in the intelligence of the average American."[117]

The history of the DNA cases and of the polygraph cases mentioned above illustrate that an evidentiary exclusion justified on the basis that the public will be overwhelmed by novel science is quite fragile. The integration of novel science and technology into the culture is a function of its efficiency and reliability, and it seems that the justice system is no exception to this rule despite an almost romantic attachment to the customary non-technological methods of judicial fact-finding.

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113. Gerlach, *supra* note 101 at 118-119.
114. *Ibid.* at 119.
115. *Béland, supra* note 46 at paras. 20 and 58.
116. *Ibid.* at para. 39.
117. *Scheffer, supra* note 62 at 336.

Where a form of evidence is widely accepted as nearly infallible, as DNA evidence has become, it acquires the power to call the legal system "wrong" in its judgments. The continued legitimacy and credibility of the justice system therefore requires that the new form of evidence be incorporated. One of the mechanisms by which the legal system is structured to ensure that this happens is through the constitutional right to make full answer and defence, as will now be discussed.

3. *Constitutional rights and the right "to make full answer and defence"*

Another important legal matter that will arise if a court refuses an accused's request to admit evidence from a lie detection technology is the issue of the constitutional right to make full answer and defence. This right was raised by dissenting judges in the Canadian and U.S. Supreme Court cases dealing with the polygraph, and is likely to be raised in the case of neuroscientific lie detection.[118]

The Supreme Court has made it clear that the right to make full answer and defense is protected by the *Canadian Charter of Rights and Freedoms*.[119] As a general proposition, all probative evidence is admissible unless there is a clear ground of policy or law that justifies its exclusion.[120] One of the policy reasons to exclude evidence is that its probative value is outweighed by its prejudicial effects on the trial (e.g., that the evidence may unduly arouse a jury's emotions of hostility or sympathy, or that it might consume an undue amount of time, etc.).[121] The effect of the *Charter* is to place a thumb on the scale in favour of the accused in this contest between probative value and prejudicial effect. While the standard for excluding prosecution evidence is whether the prejudicial effect outweighs its probative value, the *Charter* cases make it clear that in order to exclude *defense* evidence, the prejudice must "substantially outweigh"[122] the probative value. This is not a very satisfying legal test, since the meaning of "substantially outweigh" leaves much room for discretion, but it is clear that the threshold for the exclusion of defense evidence will be fairly high. The Canadian Supreme

118. *Ibid.* at 320-321; *Béland, supra* note 46 at para. 30.
119. *R. v. Rose,* [1998] 3 S.C.R. 262 at para. 97.
120. *R. v. Seaboyer,* [1991] 2 S.C.R. 577 at para. 37.
121. *Ibid.* at para. 40.
122. The Supreme Court of Canada wrote in *R. v. Seaboyer* (*ibid.* at para. 43) that "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."

Court has said that relevant and reliable evidence will only infrequently be substantially outweighed by its prejudicial effect.[123]

If neuroscientific lie detection technologies develop to the point where they are highly reliable and thus highly probative, it is difficult to imagine that the prejudicial effects they are said to cause will be able to justify the exclusion of this evidence. The argument that this technology will overawe the trier of fact and/or dehumanize the justice system is unlikely to be convincing against exculpatory evidence that is accepted as reliable, as occurred in the DNA context. The argument that this evidence would create distracting side-issues and lead to the undue consumption of time also sounds extremely hollow against exculpatory evidence that is considered highly reliable. It is a poor argument against very helpful evidence that it will take up too much time.

Conclusion

The key determinant of whether courts are likely to accept neuroscientific lie detection is the degree to which this evidence is shown to be reliable. To some, this may sound like a fine result, and one unworthy of concern or comment. However, this paper has sought to demonstrate that the courts have cultural attachments to a traditional non-technological manner of doing justice. The repeated references to the "dehumanization" of the justice system in the context of DNA and polygraph evidence illustrate this point. The theory of the autonomy of technology predicts, however, that such customs and traditions will give way to the adoption of novel technologies that are efficient and effective. This may be the right result, and, from the perspective of an accused person, the risk of an unfair conviction is a high price to pay to preserve a cultural attachment to a customary low-technology and fallible method of doing justice. On the other hand, it is possible that these cultural traditions also have some value.

In my view, these cultural attachments to credibility determination by human triers of fact are unlikely to be able to withstand the pressure to adopt reliable neuroscientific lie detection. This is because technologies that are widely accepted as reliable cannot be permitted to remain outside the justice system to deliver their own verdicts incompatible with those of the courts. The continued legitimacy of the justice system cannot tolerate this. The rules of evidence and, in particular, the constitutional guarantee of the right to make full answer and defense provide the legal mechanisms by which this accommodation would take place.

123. *Ibid.* at para. 44.

For now, the aspirations of neuroscientific lie detection are too modest to replace human beings in the courtroom. They do not currently pass the legal threshold of reliability. Furthermore, even if they do attain a sufficient degree of reliability in detecting advertent deception, they may still be unable to detect failures of memory or perception or those who have convinced themselves of their own lies. Who knows, however, where the technology will go in the future?