JUSTICE WITHOUT SCIENCE? JUDGING THE RELIABILITY OF FORENSIC SCIENCE IN CANADA

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A compelling body of scientific research demonstrates that the validity of many forensic sciences is uncertain and that courts have been ineffective in safeguarding the reliability of forensic science. While this research has had some impact in the US and UK, Canadian law and institutional arrangements have largely failed to acknowledge and respond to scientific developments.

This article explores these issues through the example of fingerprint comparison. This identification evidence has been accepted in Canadian courtrooms for more than 100 years. However, its reliability and limitations were never subjected to serious scrutiny in a Canadian court until the BC Supreme Court trial in R v Bornyk, 2017 BCSC 849. Tracing the course of the Bornyk litigation reveals systemic problems with the production and evaluation of forensic science evidence within the Canadian criminal legal system.

Il existe tout un corpus de recherche scientifique qui met sérieusement en doute la validité d'un grand nombre de branches de la criminalistique tout en démontrant que les tribunaux se sont avérés impuissants à préserver la crédibilité de cette science. Si ces études ont eu un certain retentissement aux États-Unis et au Royaume-Uni, le droit canadien et les institutions du pays se montrent en grande partie imperméables à ces découvertes.

Les auteurs prennent l'exemple des empreintes digitales, moyen d'identification reconnu par les tribunaux canadiens depuis plus d'un siècle. Or la fiabilité et les limites de cette pratique n'ont jamais été examinées sérieusement par une instance canadienne jusqu'à l'affaire R. v Bornyk, 2017 BCSC 849, de la Cour suprême de Colombie-Britannique. En examinant le cours de cette affaire, on constate des problèmes systémiques de production et d'analyse des éléments de preuve criminalistiques dans le système judiciaire pénal canadien.

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1. Introduction

In this article, we offer a critical assessment of the proceedings in *R v Bornyk*.[1] Timothy Dale Bornyk was convicted by a judge sitting alone of one count of break, enter and commit theft. The *only* evidence brought by the Crown against Bornyk was a fingerprint identification based on a single, partial latent print[2] found at the crime scene. The case therefore presented an unusually clear question of the probative value and risks of fingerprint identification evidence. More exceptionally, the fingerprint identification and associated expert evidence offered by the State was subjected to sustained critical scrutiny by the defence at trial. Highly qualified expert witnesses were called by both parties and considerable court time was devoted to presenting and interpreting contemporary scientific research regarding the reliability of fingerprint evidence.

In recent years, the Supreme Court of Canada has elevated the standard for the admissibility of expert opinion evidence[3] and emphasized that the gatekeeping responsibilities of trial judges persist throughout an expert's testimony, including with regard to factual reasoning.[4] In *R*

1 *R v Bornyk*, 2017 BCSC 849 [*Bornyk* retrial judgment].

2 A latent print is defined by Ulery and co-authors as a fingerprint impression that is left at a crime scene: Bradford T Ulery et al, "Accuracy and reliability of forensic latent fingerprint decisions" (2011) 108:19 Proceedings National Academy Science 7733. A partial latent print is one in which a significant portion of a print is missing or blurred.

3 *White Burgess Langille Inman v Abbott & Haliburton*, 2015 SCC 23 [*White Bugess*]; *R v Trochym*, 2007 SCC 6 [*Trochym*]; *R v J-L.J*, 2000 SCC 51 [*JLJ*].

4 *R v Sekhon*, 2014 SCC 15 [*Sekhon*]; *R v Awer*, 2017 SCC 2 [*Awer*]; *R v Bingley*, 2017 SCC 12 at para 13.

v Trochym, Justice Deschamps observed that "the scientific community continues to challenge and improve upon its existing base of knowledge. As a result, the admissibility of scientific evidence is not frozen in time."[5] For this reason, she held, "even if it has received judicial recognition in the past, a technique or science whose underlying assumptions are challenged should not be admitted in evidence without first confirming the validity of those assumptions."[6] In *R v Awer*, the Supreme Court of Canada cautioned trial judges to be mindful of the criminal burden of proof when evaluating conflicting expert testimony offered by forensic scientists called by Crown and defence. In that case, "the materially different levels of scrutiny to which the evidence of the two experts was subjected—none for the Crown expert and intense for the defence expert—was unwarranted, and it tended to shift the burden of proof onto" the accused.[7] These judgments, and others in which the Supreme Court of Canada has emphasized the prejudicial risks associated with expert evidence,[8] open the jurisprudential door to challenging the reliability of routine forms of forensic science, both as a matter of admissibility and for the purposes of assessing proof beyond a reasonable doubt.[9]

Fingerprint identification evidence has been integral to Canadian criminal prosecutions and guilty pleas for more than 100 years. In that long history, *Bornyk* is the first—and remains the only—case in which a Canadian court has heard detailed expert evidence about scientific research into the reliability of and evidence basis for fingerprint identification.[10] Far more often, Canadian judges and lawyers have treated fingerprint identification evidence as cogent proof that an accused person touched

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5 *Trochym*, *supra* note 3 at para 31.

6 *Ibid* at para 32.

7 *Awer*, *supra* note 4 at para 6.

8 See e.g. *R v Mohan*, [1994] 2 SCR 9, 114 DLR (4th) 419 [*Mohan* cited to SCR]; *JLJ*, *supra* note 3; *White Burgess*, *supra* note 3.

9 Additional commentary on this body of caselaw and the trends in Canadian judicial approaches to expert forensic evidence can be found, for example in: Emma Cunliffe, "A New Canadian Paradigm? Judicial Gatekeeping and the Reliability of Expert Evidence" in Paul Roberts & Michael Stockdale, eds, *Forensic Science Evidence and Expert Witness Testimony: Reliability through Reform?* (Cheltenham, UK: Edward Elgar, 2018) 310 [Cunliffe, *A New Canadian Paradigm*]; Jason Chin, "*Abbey* Road: The (Ongoing) Journey to Reliable Expert Evidence" (2018) 96:3 Can Bar Rev 422; Jason Chin & Scott Dallen, "*R v Awer* and the Dangers of Science in Sheept's Clothing" (2016) 63:4 Crim LQ 527; David Paciocco, "Unplugging Jukebox Testimony in an Adversarial System: Strategies for Changing the Tune on Partial Experts" (2009) 34 Queen's LJ 565.

10 Canadian courts were, by common law standards of the early to mid twentieth century, exceptionally cautious about fingerprint evidence. Canadian judges were particularly attentive to the circumstantial nature of this opinion evidence. Nevertheless, the claims made by fingerprint examiners were almost invariably expressed as categorical identifications, and there was no serious judicial engagement with scientific validation and

a specific object, with little or no analysis of reliability or the risk of error within that field.[11] Indeed, *Bornyk* was a rare evidence-based challenge to the reliability of *any* routine forensic science.[12] This observation, standing alone, suggests the extent to which traditional adversarial methods have failed to provide independent checks upon the reliability of routine forms of forensic science in Canada.[13]

In light of this longstanding systemic failure, the *Bornyk* case provides some important insights into the criminal legal system's capacity to evaluate research-based challenges to the reliability of routine forms of forensic science. In particular, we argue in this article that Crown counsel and the trial judge seemingly misunderstood key portions of the scientific and statistical evidence relied upon by the defence. We believe that these misunderstandings reflect a widespread lack of capacity among legal professionals when it comes to working well with scientific evidence, rather than reflecting distinctive failings on the part of these particular actors.[14] In Part 4, we supply an account of the evidence, submissions and judgment in the *Bornyk* retrial in order to evaluate where and

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the risk of error. Consider *R v De'Georgio*, 1934 CanLII 417, 1934 CarswellBC 69 (WL Can) (BC SC (TD)) and *R v Wiswell*, [1935] 1 DLR 624, 1934 CarswellNS 35 (WL Can) (NS SC (AD)).

11 There is almost no Canadian caselaw commenting on the reliability and limitations of fingerprint evidence. For an example of the (best of the) more typical Canadian judicial treatment, see *R v Mars*, 2006 CanLII 3460 at paras 19–21, 2006 CarswellOnt 722 (WL Can) (per Justice Doherty) (CA). Though, for post-*Bornyk* challenges, see note 236. Canada is not alone in this regard. See also Gary Edmond, Emma Cunliffe & David Hamer, "Fingerprint comparison and adversarialism: The scientific and historical evidence" (2020) 83:6 Mod L Rev 1287; Gary Edmond, "Latent science: A history of challenges to fingerprint evidence in Australia" (2019) 38:2 UQLJ 301; Gary Edmond et al, "Forensic science evidence and the limits of cross-examination" (2019) 42:3 Melbourne UL Rev 858.

12 Our research suggests that the only fields of forensic science that have a history of relatively regular challenge within the Canadian criminal legal system are breath-testing programs and drug evaluation techniques in the context of intoxicated driving cases. This pattern likely reflects the socio-economic resources of those charged with intoxicated driving offences, relative to other kinds of offences in which forensic science evidence is routinely relied upon.

13 See generally Gary Edmond & Kent Roach, "A Contextual Approach to the Admissibility of the State's Forensic Science and Medical Evidence" (2011) 61:3 UTLJ 343; Emma Cunliffe, "Charter Rights, State Expertise: Testing State Claims to Expert Knowledge" (2020) 94 SCLR 367 [Cunliffe, *Charter Rights*].

14 See Ian Binnie, "Science in the Classroom: The Mouse that Roared" (2007) 56 UNBLJ 307; Stephen Goudge, *Inquiry into Pediatric Forensic Pathology in Ontario: Final Report* (Toronto: Queen's Printer, 2008) at 468–470 [Goudge]; Susan Lang, *Report of the Motherisk Hair Analysis Independent Review* (Toronto: Ontario Ministry of the Attorney General, 2015) at 20–21, online (pdf): <m-hair.ca> [Lang].

how misunderstandings arose. This analysis contributes to the broader evaluation of the Canadian criminal legal system's capacity to regulate and engage with scientific evidence. We offer this analysis against a backdrop of well-documented concerns about the role that has been played by expert evidence in identified wrongful convictions in Canada.[15]

Our primary concern in this article is systemic. Ultimately, we conclude that the *Bornyk* case illuminates some of the ways in which the Canadian criminal legal system is structurally ill-equipped to develop scientifically-informed approaches to evaluating the quality of forensic science evidence. Systemic features that impede this development include the emphasis on case-by-case evidence and decision-making (with associated constraints on judges' capacity to learn about and draw upon exogenous scientific research). Another feature of significance is system-wide under-resourcing compounded by a stark disparity of resources as between the state and legally aided defendants that makes legal challenges such as *Bornyk* wholly exceptional. These structural constraints are compounded by the difficulties experienced by legal participants invited (or obliged) to engage with unfamiliar bodies of knowledge and research.[16]

The evidence called in the second *Bornyk* trial arguably demonstrated that contemporary scientific research bears directly upon an evaluation of the training, procedures and reporting practices of Canadian fingerprint examiners. However, the retrial judgment largely fails to engage with the scientific evidence, providing instead the anodyne observation that "[r]esearch from the last 10 years has given examiners standard operating principles and procedures for their assessments to improve the acceptability of their opinion evidence in court."[17] The decision to convict seems to turn partly on the trial judge's conclusion that he had not been directed to evidence that would "lead me to believe that either of the two highly qualified examiners made an error in judgment" in this particular case.[18] The language of *belief* in error raises concerns about whether the trial judge improperly placed the burden of persuasion on the defence.

In Part 2 of this article, we provide an overview of *R v Bornyk* and the issues that arose over the course of the case. In Part 3, we explain the scientific context of *Bornyk*, summarising some of the most salient

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15 See Goudge, *supra* note 13; Lang, *supra* note 13; Fred Kaufman, *Report of the Kaufman Commission on Proceedings Involving Guy Paul Morin* (Toronto: Queen's Printer, 1998).

16 See Patrick Devlin, *The Judge* (Oxford: Oxford University Press, 1979) 60-1. But see John Langbein, *The Origins of the Adversary Criminal Trial* (New York: Oxford University Press, 2003) 8.

17 *Bornyk* retrial judgment, *supra* note 1 at para 141.

18 *Ibid* at para 137.

conclusions from the several authoritative reports that have addressed the reliability and limits of fingerprint evidence over the past decade. At the end of this part, we explain why we consider the *Bornyk* retrial to have been a test case for the Canadian legal system's capacity to respond to scientific research and authoritative recommendations. In Part 4, we turn to the evidence, argument and judicial reasoning in the *Bornyk* retrial. We trace the development and resolution of issues concerning both the fundamental validity and limits of forensic fingerprint comparison as a field and the particular practice of fingerprint examination in this case.

Our analysis lends weight to the argument that the adversarial trial process is not necessarily well suited to the rigorous and principled evaluation of the weight of expert evidence. Nor does the present approach generate institutional incentives for feedback and improvement. Accordingly, in Part 5, we discuss systemic factors that render adversarial trial processes unsuitable forums for adjudicating research-informed controversies about the limits of scientific and empirical claims; and support an alternative approach.

It is appropriate, as part of this discussion, to disclose our own role in offering advice to Bornyk's legally-aided lawyers and assisting with provision of an expert for the defence. We assisted counsel to find and learn from scientific research about the reliability of fingerprint evidence and helped secure Professor Simon Cole's agreement to provide an expert report and testify.[19] In taking these steps, we sought to work within existing systems of adversarial trial practice, to ensure that the court heard relevant and rigorous evidence about the practice and limitations of fingerprint comparison. Our work was conducted without payment, alongside our continuing efforts with legal and judicial education, collaborative work with forensic scientists, and scholarly research and publication. In short, in offering to assist counsel to prepare for the *Bornyk* re-trial we sought to improve the quality of the evidence available to the parties and the court. Ultimately, however, our role was advisory. Defence counsel took sole responsibility for decisions about how witnesses should be examined, evidence offered, and overall case strategy.

2. The *Bornyk* Case

Bornyk's factual matrix is straightforward, although its procedural history is somewhat unusual. In early July 2010 a break and enter was perpetrated at a home in Surrey, BC. According to the home owners and police who attended the scene, the home was thoroughly ransacked and many valuable items were stolen. An RCMP fingerprint examiner,

19 Professor Cole was not paid for his work in this case.

Constable (subsequently Corporal) Bradley Wolbeck and a Forensic Identification Assistant, Erin McGreevy, searched the home thoroughly for trace evidence that could assist with identifying the perpetrator. The only evidence they found was a single, partial, latent fingerprint located on a plastic-covered box that contained a collectible doll. We will refer to a photograph taken by McGreevy of this print as the crime scene print. The homeowner testified that the doll had been moved from its usual location. The evidence suggested that a very small number of people had handled the box since the homeowner had obtained it. None of these individuals—including the homeowner—were fingerprinted for comparison with the crime scene print.[20]

Bornyk was identified as a potential match for the crime scene print through the Automated Fingerprint Identification System ("AFIS"), some months after the crime.[21] Wolbeck accordingly retrieved from another RCMP detachment a photocopy of prints known to have been made by Bornyk (we will call this photocopy the reference print). After comparing the crime scene print and reference print, Wolbeck prepared a report stating that based on his "training, knowledge and experience" he had 'formed the opinion' that the two prints "were made by the same person."[22]

Bornyk was duly charged with break, enter and theft contrary to s. 348(1)(d) of the *Criminal Code*. He first came to trial in April 2013 before Justice Funt, sitting without a jury. Eight witnesses were called at this trial, but the only witness who testified about fingerprint identification was Wolbeck. When testifying in chief about his qualifications, Wolbeck described his training before explaining that "if there is any errors made on a fingerprint, it's immediate withdrawal or removal from the program.

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[20] Corporal Wolbeck did not explain why the homeowners and others with innocent access to the property were not fingerprinted in this case. However, in his testimony during Bornyk's retrial, he related a story that suggested that it has been his practice in other cases to use fingerprints from homeowners and victims for exclusion purposes. *R v Bornyk*, retrial transcript at 29 (Wolbeck, evidence in chief, 24 January 2017) [*Bornyk* Retrial Transcript].

[21] Bornyk's prints were already in the AFIS system when the initial search was performed. The Crown did not call evidence about how AFIS operates or why the potential match was only identified after Bornyk's prints were re-entered in 2011.

[22] Such categorical identifications (also known as individualization) are widely criticised. See e.g. Simon Cole, "Individualization is Dead: Long Live Individualization!" (2014) 13:2 L, Probability & Risk 117 [Cole, *Individualization*]; William C Thompson & Eryn J Newman, "Lay understanding of forensic statistics: Evaluation of random match probabilities, likelihood ratios, and verbal equivalents" (2015) 39:4 L & Human Behavior 332.

There's no errors allowed in fingerprint identification."[23] Wolbeck confirmed in response to a follow up question from the Crown: "I've never made an error."[24] He was qualified without objection.

Wolbeck described the process of fingerprint examination to the Court before explaining that after comparing the crime scene latent to the reference print he concluded that "there are some very unique details with this fingerprint."[25] Wolbeck testified that he had identified "without difficulty, at least 20 … specific ridge details" that corresponded as between the two prints and that he had also considered the spatial relationship between features.[26] He explained that, on this basis, he had concluded that "there is sufficient uniqueness to individualize" this fingerprint to Bornyk's right ring finger and that a colleague verified his conclusion.[27] The Court did not, however, hear evidence from the verifying officer. The defence did not call any witnesses. After four hearing days held across three calendar months, Justice Funt reserved his decision.

The trial transcript records that after reserving, Justice Funt "became aware of some further material" bearing upon the reliability of the fingerprint evidence.[28] He shared this material with counsel and requested that they make further submissions. The material that Justice Funt shared included a report by the National Research Council of the National Academy of Sciences,[29] a report by Justice (now Lord) Anthony Campbell titled *The Fingerprint Inquiry Report*,[30] a report by an Expert Working Group of the National Institute for Standards and Technology,[31] and a law review article by Simon Cole and Andrew Roberts.[32] After he shared these reports and article with counsel, Crown counsel provided the Court and defence counsel with three further articles.[33] Justice Funt invited

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23 *R v Bornyk*, trial transcript at 94 (Wolbeck, evidence in chief on qualifications, 11 April 2013) [*Bornyk* Trial Transcript].

24 *Ibid*.

25 *Ibid* at 115 (Wolbeck, evidence in chief, 11 April 2013).

26 *Ibid*.

27 *Ibid*.

28 *Ibid* at 212 (5 September 2013).

29 National Research Council of the National Academies of Science, *Strengthening Forensic Science in the United States: A Path Forward* (Washington, DC: National Academies Press, 2009), online (pdf): <www.ncjrs.gov> [NRC Report].

30 Sir Anthony Campbell, *The Fingerprint Inquiry Report* (Edinburgh, Scotland: Crown Copyright, 2011), online (pdf): <citeseerx.ist.psu.edu> [Fingerprint Inquiry Report].

31 Expert Working Group on Human Factors in Latent Print Analysis, *Latent Print Examination and Human Factors: Improving the Practice through a Systems Approach* (Washington, DC: US Department of Commerce, National Institute for Standards & Technology, 2012), online: <www.nist.gov> [NIST Report].

32 Simon Cole & Andrew Roberts, "Certainty, individualisation, and the subjective nature of expert fingerprint evidence" (2012) 11 Crim L Rev 824 at 824–849.

33 *Bornyk* Trial Transcript, *supra* note 23 at 213 (5 September 2013).

further submissions from the Crown and defence, but did not suggest that Wolbeck should be recalled. Three additional days of submissions ensued.

In October 2013, Justice Funt issued a verdict of acquittal.[34] After describing the evidence and argument, and documenting the unusual procedural history, Justice Funt identified "a number of troubling aspects … from Corporal Wolbeck's reports and testimony."[35] These troubling aspects included concerns about 'institutional bias' arising from the RCMP's 'no errors' policy, which he identified as antithetical to the court's expectation that an expert should be free to change his or her mind where circumstances suggest such a change is appropriate, "not shackled by the fear of losing his or her position."[36] Justice Funt also provided a list of other concerns.[37] Ultimately, Justice Funt concluded "I have more than a reasonable doubt that there is a match of the latent fingerprint to the known fingerprint."[38]

The Crown appealed this acquittal. The Court of Appeal for British Columbia held in 2015 that Justice Funt had made two legal errors. First, he "erred in relying upon independently researched literature that was not properly introduced by either party, not tested in evidence, and not put to the fingerprint witness."[39] Secondly, he erred "by engaging in his own unguided comparison of the latent print and known print."[40] The Court of Appeal was unusually pointed in its criticisms of the manner in which Justice Funt had proceeded, concluding that "the judge stepped beyond his proper neutral role and into the fray. In doing so, he compromised the appearance of judicial independence essential to a fair trial."[41] The Court of Appeal vacated the verdict and ordered a retrial.[42] The retrial forms the main focus of our present analysis.

Bornyk's retrial occurred in January 2017 before Justice Crawford in New Westminster. The eight witnesses called at Bornyk's original trial testified again, and Wolbeck was cross-examined at greater length than during the first trial. In addition, the Crown called evidence from RCMP Staff Sergeant Adele McNaught, who verified Wolbeck's match

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34 *R v Bornyk*, 2013 BCSC 1927 [*Bornyk* acquittal judgment].

35 *Ibid* at para 39.

36 *Ibid* at para 42.

37 *Ibid* at para 60 citing the Fingerprint Inquiry Report, *supra* note 30 at 610.

38 *Bornyk* acquittal judgment, *supra* note 34 at para 61.

39 *R v Bornyk*, 2015 BCCA 28 at para 6 [*Bornyk*, BCCA decision].

40 *Ibid.*

41 *Ibid* at para 11.

42 See Gary Edmond, David Hamer & Emma Cunliffe, "A Little Ignorance is a Dangerous Thing: Engaging With Exogenous Knowledge Not Adduced by the Parties" (2016) 25:3 Griffith L Rev 383 [Edmond, Hamer & Cunliffe, *A Little Ignorance*].

conclusion, and from Dr Della Wilkinson, a research scientist with the Integrated Forensic Identification Services section of the RCMP. Wilkinson is a member of the International Association for Identification and has acted as the RCMP's representative on US-based committees tasked with studying, standardizing and improving fingerprint comparison.[43]

The defence called Dr. Simon Cole, a Professor in the School of Social Ecology at the University of California, Irvine. Cole has spent much of his career studying the field of fingerprint examination. His 2001 book *Suspect Identities: A History of Fingerprinting and Criminal Identification*[44] was the first to argue that the fingerprint examiner community's "*claim*[s] to scientific rigor foreclosed serious questioning of that claim's *validity*."[45] The criticisms Cole has published of fingerprint examiners' methods and claims are adopted in several of the reports summarised in Part 3 of this article and cited with approval in almost all of the foundational publications relied upon by Wilkinson in her evidence during the *Bornyk* retrial. Cole's work has informed scientific and regulatory evaluations of the reliability of fingerprint evidence, which have ultimately led to changes adopted by law enforcement agencies such as the FBI and US military.

Neither Wilkinson nor Cole is a trained fingerprint examiner. Rather, they acted as *meta*-experts familiar with the history, procedures, standards of fingerprint comparison as well as relevant scientific research. Their testimony drew directly on several of the reports cited by Justice Funt during the original trial. In preparation for the retrial, these witnesses drafted case-specific reports. In addition, the parties filed extracts from government and scientific reports. Much of their evidence focused on the examiners' training, RCMP fingerprint comparison procedures, and the basis on which the examiners claimed that they had concluded that the crime scene latent and reference print had been made by the same person. Wilkinson and Cole testified about the validity and reliability of fingerprint comparison evidence. Their testimony—and lawyers' arguments about its implications—formed the major focus of the retrial. Bornyk did not testify at either trial.

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43 *Bornyk* Retrial Transcript, *supra* note 20 at 77–79 (Della Wilkinson, 24 January 2017).

44 Simon A Cole, *Suspect Identities: A History of Fingerprinting and Criminal Identification* (Boston: Harvard University Press, 2001).

45 David Ralph Johnson, "Suspect Identities: A History of Fingerprinting and Criminal Investigation (Review)" (2002) 33:2 J Interdisciplinary History 281 at 282 [emphasis in orginal].

3. The Scientific Context of the *Bornyk* Case

The reports we discuss in this section were produced by peak scientific and technical organisations that carefully studied the evidence-basis for routine fields of forensic science.[46] These reports emphasize the need to validate procedures, develop and apply meaningful standards, measure performance, accuracy and error, develop empirically-based means of expressing results, and guard against the dangers introduced by human interpretation and potential sources of bias.

Former Chief Justice Harry Edwards of the United States Court of Appeals DC Circuit was the co-chair of the National Research Council committee that authored the *NRC Report* flagged by Justice Funt and discussed in evidence at Bornyk's retrial. Soon after the *NRC Report* was published, Edwards explained the significance of this work to his own appreciation of the empirical foundation for the forensic sciences. He described assuming:

> as I suspect many of my judicial colleagues do, that the forensic disciplines are well grounded in scientific methodology and that crime laboratories and forensic practitioners follow proven practices that ensure the validity and reliability of forensic evidence offered in court. I was surprisingly mistaken in what I assumed.[47]

Edwards explains the considerable efforts made by a committee composed of forensic practitioners, research scientists, judges and legal academics to understand the research basis for forensic science disciplines including fingerprint comparison. In addition to listening to testimony and reviewing materials supplied by practitioners, the committee "carefully considered any peer-reviewed, scientific research purporting to support the validity and reliability of existing forensic disciplines."[48] The committee invited forensic scientists to refer pertinent research to them, and reviewed all research they received.

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[46] See e.g. Gary Edmond et al, "Admissibility Compared: The Reception of Incriminating Expert Evidence (i.e. Forensic Science) in Four Adversarial Jurisdictions" (2013) 3 U Denver Crim L Rev 31; Gary Edmond, "What lawyers should know about the forensic 'sciences'" (2014) 36:1 Adel L Rev 33; Gary Edmond & Kristy Martire, "Forensic science in criminal courts: The latest scientific insights" (2016) 42:3 Austl Bar Rev 367; Gary Edmond, Emma Cunliffe, Kristy Martire & Mehera San Roque, "Forensic Science Evidence and the Limits of Cross-Examination" (2019) 42:3 Melbourne UL Rev 858.

[47] Harry T Edwards, "The National Academy of Sciences Report on Forensic Sciences: What it Means for the Bench and Bar" (2010) 51:1 Jurimetrics J L, Science & Technology 1 at 3.

[48] *Ibid*.

The unanimous *NRC Report* directed unprecedented scepticism at the 'method' of latent fingerprint examination ("ACE-V") and the contention that ACE-V is rigorous and scientific. ACE-V is an acronym for 'analysis, comparison, evaluation—verification.'[49] Based on their comprehensive review, the authors of the *NRC Report* endorsed the conclusion that fingerprint examination as then practiced lacked a scientific foundation: "We have reviewed available scientific evidence of the validity of the ACE-V method and found *none*."[50]

The *NRC Report* explained that:

> ACE-V does not guard against bias; is too broad to ensure repeatability and transparency; and does not guarantee that two analysts following it will obtain the same results. For these reasons, merely following the steps of ACE-V does not imply that one is proceeding in a scientific manner or producing reliable results.[51]

In 2016 President Obama's Council of Advisors on Science and Technology ("PCAST") recognised two studies that met its criteria for scientific validation of fingerprint comparison (both were conducted in response to the *NRC Report* though only one had been published in a peer-reviewed journal).[52] PCAST defined 'foundational validity' to mean "that a large group of examiners analyzing a specific type of sample can, under test conditions, produce correct answers at a known and useful frequency."[53] PCAST concluded on the basis of the two qualifying studies that:

> latent fingerprint analysis is a foundationally valid subjective methodology—albeit with a false positive rate that is substantial and is likely to be higher than expected by many jurors based on longstanding claims about the infallibility of fingerprint analysis.
>
> Conclusions of a proposed identification may be scientifically valid, provided that they are accompanied by accurate information about limitations on the reliability of the conclusion—specifically, that (1) only two properly designed studies of

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49 See Lynn Haber & Ralph Haber "Scientific validation of fingerprint evidence under *Daubert*" (2008) 7:2 L Probability & Risk 87 (for a description of ACE-V) [Haber & Haber].

50 *Ibid* at 105 [emphasis added]. See NRC Report, *supra* note 29 at 142–143, citing Haber & Haber, *supra* note 49.

51 NRC Report, *supra* note 29 at 142.

52 The President's Council of Advisors on Science and Technology, *Report to the President: Forensic Science in Criminal Courts: Ensuring Scientific Validity of Feature-Comparison Methods* (Washington, DC: President's Council of Advisors on Science and Technology, 2016) at 95–96, online (pdf): <obamawhitehouse.archives.gov> [PCAST Report].

53 *Ibid* at 101.

> the foundational validity and accuracy of latent fingerprint analysis have been conducted, (2) these studies found false positive rates that could be as high as 1 error in 306 cases in one study and 1 error in 18 cases in the other, and (3) because the examiners were aware they were being tested, the actual false positive rate in casework may be higher. At present, claims of higher accuracy are not warranted or scientifically justified. Additional black-box studies are needed to clarify the reliability of the method.[54]

In summary, while research conducted since the *NRC Report* was published has established that fingerprint analysis is foundationally reliable, the *PCAST Report* places many caveats and warnings on the claims that fingerprint examiners could legitimately make.[55]

The *PCAST Report* also differentiates the foundational validity of a forensic method from 'validity as applied.' The report defines validity as applied to include the following considerations:

> 1) The forensic examiner must have been shown to be capable of reliably applying the method and must actually have done so.
>
> 2) Assertions about the probability of the observed features occurring by chance must be scientifically valid.
>
> …
>
> An expert should not make claims or implications that go beyond the empirical evidence and the applications of valid statistical principles to that evidence.[56]

A year after *Bornyk* was decided, the American Association for the Advancement of Science ("AAAS") published a 'quality and gap analysis' on fingerprint comparison.[57] Based on a systematic review of the published literature, the AAAS report concluded, relevantly, that:

> Examiners may well be able to exclude the preponderance of the human population as possible sources of a latent print, but there is no scientific basis for estimating the number of people who could not be excluded and there are no scientific criteria for determining when the pool of possible sources is limited to a single person.[58]

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54 *Ibid* at 101–102.

55 *Ibid* at 95–97.

56 *Ibid* at 6.

57 William Thompson et al, *Forensic Science Assessments Quality and Gap Analysis: Latent Fingerprint Examination* (Washington, DC: American Association for the Advancement of Science, 2017), online (pdf): <www.aaas.org> [*AAAS Report*].

58 *Ibid* at 5.

This important finding bears on how 'same source' opinions ought to be understood. The *AAAS Report* explained:

> Latent print examiners traditionally claimed to be able to 'identify' the source of a latent print with 100% accuracy. These claims were clearly overstated and are now widely recognized as indefensible.[59]

The *NRC Report*, *PCAST Report* and *AAAS Report* all express concerns about the vague standards and protocols associated with the process of latent fingerprint comparison. A report produced by yet another scientific body, an expert working group constituted by the National Institute for Standards and Technology ("NIST"), concludes that there are no objective standards in place for comparisons. Their report explains that "[t]he thresholds for these decisions can vary among examiners and among forensic service providers."[60]

These reports also signal the need to study and address threats posed by cognitive biases. Explicitly focused on the threat that cognitive bias poses to the accuracy of fingerprint evidence, the *NIST Report* explains how bias might operate unconsciously, through suggestion or confirmation, to influence the perceptions of competent, well-intentioned forensic practitioners:

> Observers' expectations have been shown to influence judgment in a broad range of tasks. Especially when confronted with ambiguous stimuli, people tend to see what they hope or expect to see … some information about the origin of a latent print can facilitate accurate results, but other contextual information can produce confirmation bias. Extraneous information can influence people acting in good faith and attempting to be fair interpreters of the evidence.[61]

The *NIST Report* recommended that forensic practitioners should not be provided with information from the case or the investigation that is not required for their analysis: "[p]rocedures should be implemented to protect examiners from exposure to extraneous (domain-irrelevant) information."[62] Similarly, PCAST concluded that procedures designed by

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59 *Ibid* at 9.

60 NIST Report, *supra* note 31 at 7, 54 ("Recommendation 3.4: Each agency or forensic service provider should define 'suitable' or 'sufficient' in its standard operations procedures. These guidelines should be as explicit as possible about what is expected for sufficiency determinations at different stages of the latent print examination process").

61 *Ibid* at 10.

62 *Ibid* at 198. See also Fingerprint Inquiry Report, *supra* note 30 at Recommendations 6–8.

the FBI to reduce the risk of confirmation bias in latent print examination "need to be universally adopted by all laboratories."[63]

In *Bornyk,* the defence, Crown and expert witnesses poured time, expertise and resources into bringing this scientific research before a Canadian trial court for the first time. The time, expertise and effort involved in building an evidentiary record of this kind is simply not available in most criminal cases, including serious, complex, and contested matters. For these reasons, *Bornyk* is an important test of the Canadian legal system's capacity to engage in a principled manner with the challenges that arise at the intersection of what has been called the 'new Canadian paradigm' of judicial gatekeeping in respect of expert testimony in criminal trials and the growing body of scientific research on the limitations of forensic science procedures.[64]

4. The *Bornyk* retrial

> The sole evidence against Mr. Bornyk is a latent fingerprint, found on a plastic wrapper around a cardboard box containing a collectible doll[.][65]

In *Bornyk,* all participants devoted an unusual amount of court time and other resources to obtaining and adducing evidence about the reliability of fingerprint comparison as practiced by the RCMP. The case therefore offered a rare opportunity to examine the quality of the forensic science services provided to the criminal justice system by an important Canadian state institution. In this part, we identify numerous ways in which the *Bornyk* decision fails to grapple with the adduced evidence and debates at trial.

A) Two theories of the case

For reasons that will become evident in our analysis, we suspect that a person who reads the *Bornyk* retrial judgment without additional information would have some difficulty making sense of the competing theories of the case offered by the Crown and defence. Most significantly to us, the judgment affords no real sense of the degree to which the defence grounded its challenge upon consensus-based mainstream scientific research and expert testimony.

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63 PCAST Report, *supra* note 52 at 100. This is consistent with recommendations made by the US National Commission on Forensic Science (2015), online <https://www.justice.gov/ncfs>.

64 Cunliffe, *A New Canadian Paradigm*, *supra* note 9.

65 *Bornyk* retrial judgment, *supra* note 1 at para 2.

After Bornyk was convicted, Wilkinson and two co-authors published an article in the *Journal of Forensic Identification* in which they explained:

> Eventually, the [RCMP] strategy coalesced into communicating the following main objectives to the trier of fact: (1) the proficiency testing and training of the fingerprint expert, (2) the quality of [the crime scene latent], (3) the reliability and accuracy of ACE, and (4) the recent scientific publications that address recommendations raised by the [NRC] report. The publication of the PCAST report four months before the retrial provided a template for presenting fingerprint evidence that was adopted by the RCMP.[66]

The authors report that this strategy "allowed the RCMP to provide a comprehensive defense of its practices" in the face of the challenge raised by the defence in the *Bornyk* retrial.[67] This articulation of the RCMP's strategy with respect to the expert evidence provides insight into the overall Crown strategy.

The defence theory of the case had two key strands. The first was to argue that "the process that Corporal Wolbeck followed in making his ultimate conclusion has vulnerabilities that were not accounted for when he made his claim."[68] The second was to assert that the RCMP investigation had failed to exclude alternative plausible donors of the crime scene latent.[69] In the defence submission, these two strands worked together to raise a reasonable doubt about the identity of the perpetrator of the crime with which Bornyk was charged.

Defence counsel Jeff Ray relied heavily upon the scientific and government reports that had been published at the time of the retrial when detailing the vulnerabilities in the RCMP process. The vulnerabilities Ray pointed to included Wolbeck's failure to document the features in the crime scene print in writing prior to examining the reference print, in apparent contravention of written RCMP policies and procedures.[70] Ray relied upon a *PCAST Report* recommendation that states:

> Work by FBI scientists has shown that examiners often alter the features that they initially mark in a latent print based on comparison with an apparently matching exemplar. Such circular reasoning introduces a serious risk of confirmation bias.

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66 Della Wilkinson, David Richard & David Hockey, "Expert Fingerprint Testimony Post-PCAST—A Canadian Case Study" (2018) 68:3 J Forensic Identification 299 at 308 [Wilkinson et al].

67 *Ibid* at 320.

68 *Bornyk* Retrial Transcript, *supra* note 20 at 2 (Closing address, Jeffrey Ray, 30 January 2017).

69 *Ibid* at 18.

70 *Ibid* at 2.

> Examiners should be required to complete and document their analysis of a latent fingerprint before looking at any known fingerprint and should separately document any additional data used during their comparison and evaluation.[71]

Ray also pointed to risks of contextual bias arising from the use of AFIS to identify a candidate match for the crime scene latent.[72] In making this argument, he relied upon Cole and Wilkinson's testimony, the *NIST Report* and *PCAST Report*.[73] He argued that the verification completed by McNaught could not be regarded as independent confirmation of the correctness of Wolbeck's conclusion because McNaught was aware of Wolbeck's conclusions—and of the adverse career consequences of making an error—when she completed the verification.[74] Ray pointed to the fact that the RCMP had changed its verification practices to a blind process (in which the verifier does not know the conclusion reached by the original examiner) in support of his argument that the verification process in this case was unsound.

Ray emphasized the subjectivity inherent in many aspects of a fingerprint examiner's work. This subjectivity extended from the initial assessment of latent print clarity[75] to the decision about whether visible dissimilarities between a crime scene latent and reference print reflect that the prints come from different sources, or are explicable as artefacts of the process of making an imperfect two-dimensional impression (or image) of a three-dimensional object.[76] He relied upon the *NRC Report's* express concerns about the ACE-V process[77] and criticized an argument made by the Crown that the error rate determined for fingerprint identification in the *PCAST Report*[78] was unrealistically high and inapplicable to this case.[79]

Turning to the second strand of the defence case—the failure to exclude alternative plausible donors of the crime scene latent—Ray pointed to the

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71 PCAST Report, *supra* note 52 at 10.

72 *Ibid* at 6.

73 NIST Report, *supra* note 31 at 63; PCAST Report, *supra* note 52 at 96.

74 *Bornyk* Retrial Transcript, *supra* note 20 at 8–9 (Closing address, Jeffrey Ray, 30 January 2017).

75 *Ibid* at 10–12 (relying on Cole's evidence regarding R Austin Hicklin et al, "Latent Fingerprint Quality: a Survey of Examiners" (2011) 61:4 J Forensic Identification 385).

76 *Ibid* at 13–14.

77 NRC Report, *supra* note 29 at 142–45 cited in *Bornyk* Retrial Transcript, *supra* note 20 at 14 (Closing address, Jeffrey Ray, 30 January 2017).

78 PCAST Report, *supra* note 52 at 9–10.

79 *Bornyk* Retrial Transcript, *supra* note 20 at 14–15 (Closing address, Jeffrey Ray, 30 January 2017).

state's retrieval of a single partial latent print from a thoroughly ransacked home, coupled with the RCMP officers' claim to have undertaken an exhaustive search for prints. He argued that this evidence raised questions about whether "the real perpetrator of the break and enter handled all these items but had gloves on."[80] Given these facts, Ray criticised the RCMP for failing to take simple measures such as fingerprinting the home owners to eliminate the possibility of an innocent donor. Ultimately, he argued that this failure to investigate amounted to a "failure to exclude other potential donors of the print."[81] In sum, Ray submitted:

> In my respectful submission, My Lord, the simple fact is that you cannot conclude beyond a reasonable doubt that the single partial latent print on the Living Doll box was deposited there during the course of the break and enter, you cannot conclude beyond a reasonable doubt that the latent print represents Mr. Bornyk's fingerprint.[82]

The defence did not press any suggestion that Bornyk had innocent access to the collectible doll on which the crime scene latent was detected. Accordingly, the task that presented itself to Justice Crawford was to decide whether he was satisfied beyond a reasonable doubt that Bornyk had left the crime scene latent and was therefore the perpetrator of the crime. To reach this conclusion, he needed to be satisfied that the Crown had disproven any reasonable possibility of error in the RCMP's fingerprint identification.

B) Analyzing a judge's factual reasoning: some legal principles

The *Bornyk* retrial decision was issued by Justice Crawford, sitting as trier of fact. For this purpose, the range of relevant considerations is somewhat different from a judgment issued on a question of law such as a decision about the admissibility of expert evidence.[83] In particular, appellate review of a trial judge's factual reasoning is more constrained than appellate review of legal reasoning.[84] Of course, this is not to say that the verdict decisions issued by trial judges are immune from appellate review. Supreme Court of Canada decisions establish that a trial judge's reasons for verdict may be examined for evidence of an error of law, such as an error in the principles

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80 *Ibid* at 17.

81 *Ibid* at 18.

82 *Ibid*.

83 The defence did not argue that latent fingerprint was inadmissible. Whether categorical opinions (issued without any indication of error rates) *should* be admitted remains an important question.

84 *R v Yebes*, [1987] 2 SCR 168, 43 DLR (4th) 424 [[*Yebes*]; *R v Biniaris*, 2000 SCC 15 [*Biniaris*].

applicable to the burden of proof, or the process of credibility assessment, or defining the elements of the offence.[85]

Pointing to the principles of appellate review is a simple way to illustrate two fundamental points of relevance to our evaluation of the *Bornyk* retrial. First, legal principles such as the burden and standard of proof constrain the factual reasoning of trial judges when reaching a verdict. Second, a trial judge's reasons for verdict are regarded by appellate courts as an important source of information about whether the trial judge has acted within these constraints. In *R v Sheppard,* the Supreme Court of Canada observed that "[r]easons for judgment are the primary mechanism by which judges account to the parties and to the public for the decisions they render."[86] The Court signaled the 'particular importance' of reasons "when a trial judge is called upon to address troublesome principles of unsettled law, or to resolve confused and contradictory evidence on a key issue."[87]

There is relatively little appellate guidance about how trial judges should assess expert evidence when sitting as trier of fact. However, some recent cases provide important—albeit brief—direction. In *R v Sekhon,* Justice Moldaver held that a trial judge who hears evidence that goes beyond the proper scope of the admissible expert evidence must not rely on that evidence when reaching a verdict:

> Judges … are accustomed to disabusing their minds of inadmissible evidence. It goes without saying that where the expert evidence strays beyond its proper scope, it is imperative that the trial judge not assign any weight to the inadmissible parts.[88]

In the context of an article that touches on the risks of cognitive bias, we would be remiss if we did not observe that there is some reason to doubt whether judges are always capable of disabusing themselves of inadmissible evidence once they have heard it.[89] Nonetheless, Justice Moldaver's basic point—that trial judges sitting as trier of fact have ongoing duties with respect to expert evidence—demonstrates that the trial judges' responsibility to actively evaluate expert testimony does not

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85 *R v Beaudry*, 2007 SCC 54; *Yebes*, *supra* note 84; *Biniaris*, *supra* note 84.

86 *R v Sheppard*, 2002 SCC 26 at para 15 [*Sheppard*]. See also *R v REM*, 2008 SCC 51 at paras 11–13.

87 *Sheppard*, *supra* note 86 at para 55.

88 *Sekhon*, *supra* note 4 at para 48.

89 Andrew Wistrich, Chris Guthrie & Jeffrey Rachlinski, "Can Judges Ignore Inadmissible Information? The Difficulty of Deliberately Disregarding" (2005) 153 U Pa L Rev 1251; Gary Edmond & Kristy Martire, "Just cognition: Scientific Research on Bias and Some Implications for Legal Procedure and Decision-Making" (2019) 82:4 Mod L Rev 633.

end with the admissibility decision. Similarly, in *R v Awer*, the Supreme Court of Canada overturned a conviction, criticizing the trial judge for subjecting expert evidence adduced by the defence to much greater critical scrutiny than he gave to the Crown's expert evidence when sitting as trier of fact.[90] These cases illustrate the ongoing nature of the trial judge's responsibilities in this domain.

In *R v Abbey (No 1)*, Justice Doherty also offered guidance on the relationship between admissibility determinations and ultimate assessments of reliability. Justice Doherty noted:

> In performing the 'gatekeeper' function, a trial judge of necessity engages in an evaluation that shares some of the features with the evaluation ultimately performed by the jury if the evidence is admitted. The trial judge is, however, charged only with the responsibility to decide whether the evidence is sufficiently reliable to merit its consideration by the jury. [91]

Many contemporary cases about the admissibility of expert evidence suggest that expert evidence presents a distinctive set of threats to the trial process.[92] In the course of stiffening admissibility requirements for expert evidence, the Supreme Court has taken notice that unreliable expert testimony has been implicated in wrongful convictions in Canada.[93] In a case where the reliability of forensic science evidence is squarely in issue, it may be incumbent upon the trial judge to approach the evidence in a manner that is sensitive to the concerns raised by the Supreme Court of Canada about the particular dangers of expert testimony.[94]

Other strands of case law bear upon other dimensions of the trial judge's responsibilities when sitting as trier of fact. For example, *Villaroman* imposes responsibilities upon a trial judge sitting as trier of fact in a case that turns on circumstantial evidence to expressly consider whether reasonable alternative inferences arise and perhaps to explain why proferred alternative inferences—such as the risk of error argued by the defence in this case—are not reasonable. Much of the case law

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90 *Awer*, *supra* note 4 at para 6.

91 *R v Abbey*, 2009 ONCA 624 at para 142 [*Abbey*].

92 See e.g. *R v DD*, 2000 SCC 43 at paras 48–56 [*DD*]; *Mohan*, *supra* note 8 at 21–22; *R v Béland*, [1987] 2 SCR 398 at 434, 43 DLR (4th) 641.

93 *Trochym*, *supra* note 3 at para 1; *White Burgess*, *supra* note 3 at para 12; *DD*, *supra* note 92 at paras 48–56.

94 *Trochym*, *supra* note 3 at para 36; *JLJ*, *supra* note 3 at para 33; *White Burgess*, *supra* note 3 at para 12.

on circumstantial evidence, including *Villaroman,* draws a distinction between reasonable alternative inferences and speculation.[95]

In *Villaroman,* Justice Cromwell emphasized that a reasonable alternative inference need not be based on proven facts:

> Requiring proven facts to support explanations other than guilt wrongly puts an obligation on an accused to prove facts and is contrary to the rule that whether there is a reasonable doubt is assessed by considering all of the evidence. The issue with respect to circumstantial evidence is the range of reasonable inferences that can be drawn from it. If there are reasonable inferences other than guilt, the Crown's evidence does not meet the standard of proof beyond a reasonable doubt.[96]

Similarly, an alternative inference is not speculative merely because it arises from a gap or absence in the evidence.[97]

It is with these principles foregrounded that we turn to consider the evidence in *Bornyk* and Justice Crawford's reasoning following the *Bornyk* retrial. We explore Justice Crawford's characterization of the reliability challenge, the risks of error in fingerprint identification, and his analysis of the proferred alternative hypothesis that the crime scene print had been left by someone with innocent access to the object on which it was found. With the legal principles that guide a trial judge's factual reasoning in mind, we document discontinuities between the detailed evidence and submissions documented in the trial record and Justice Crawford's reasons for judgment, particularly with respect to the defence theory of the case.

C) Judicial reasoning in the *Bornyk* retrial verdict

i) Understanding the reliability challenge

Our account of the two theories of this case shows that the reliability and the limits of fingerprint comparison were squarely at issue in the *Bornyk* retrial. However, the verdict does not provide a comprehensive review of the evidence or a thorough articulation of the defence theory with respect to the reliability of Wolbeck and McNaught's match conclusion. The term 'reliable' or 'reliability' is used four times in the course of the

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95 *R v Villaroman*, 2016 SCC 33 at paras 37–38 [*Villaroman*] (drawing on Benjamin L Berger "The Rule in Hodge's Case: Rumours of its Death are Greatly Exaggerated" (2005) 84:1 Can Bar Rev 47 at 60).

96 *Villaroman*, *supra* note 95 at para 35.

97 *Ibid* at para 36.

judgment: when summarizing evidence given about a study of error rates in fingerprinting;[98] when summarizing an aspect of defence counsel's submissions;[99] and twice when describing Crown counsel's submissions.[100]

Each of these uses of the term 'reliability' attributes a claim about reliability to a witness or lawyer without passing comment on the trial judge's finding with respect to that claim. Indeed, Justice Crawford only uses words such as reliability, validity and accuracy when summarising evidence and arguments. It is somewhat difficult to tell from these extracts, or from the overall decision, that the evidence at trial and counsels' closing submissions invited Justice Crawford to assess the reliability of the field of fingerprint comparison, the role of procedural safeguards against misidentification, the practices adopted by examiners in this case, and the implications of recent scientific and government reports for the accuracy of the match determination in this case. Nor is it obvious from the judgment that Justice Crawford considered or consciously evaluated the competing interpretations he heard of the scientific literature on key matters such as error rates and the significance and applicability of a statistical study that formed the basis of considerable discussion at trial. Although a reader may presume that the trial judge accepted the interpretations of the scientific research on which his conviction must be premised, the decision does not record the extent to which Wilkinson, Cole and the lawyers brought evidence, arguments and the scientific reports to bear upon their claims about the reliability of the match determination in this case. One illustration of how central these reports were to the evidence and arguments at trial is that the acronym 'PCAST' appears 118 times in the transcript. By contrast, Justice Crawford does not cite or refer to the *PCAST Report,* nor to the similarly foundational Scottish *Fingerprint Inquiry Report* and *NIST Report* anywhere within his judgment.[101]

Justice Crawford did refer briefly to the *NRC Report.* As we explained in Part 3, the *NRC Report* emphasized that the ACE-V process had not been empirically validated and did not guarantee reliability or replicability. The Report explained that "subjectivity is intrinsic to friction ridge analysis."[102] The *NRC Report* concludes that fingerprint examiners and other disciplines "need to develop rigorous protocols to guide these subjective interpretations and pursue equally rigorous research and evaluation programs."[103] The NRC and subsequent reports posit a relationship between the subjectivity of ACE-V, the adoption of

98 *Bornyk* retrial judgment, *supra* note 1 at para 96.
99 *Ibid* at para 118.
100 *Ibid* at paras 127–28.
101 *Ibid* at para 109.
102 NRC Report, *supra* note 29 at 139.
103 *Ibid* at 8.

protocols to guide subjective decisions, and the risk of error. At trial, this relationship was explained by the meta-experts and through extracts from the reports—indeed it was at the heart of defence counsel's submissions about the vulnerability of the procedures adopted by the RCMP in this case—but is not addressed in Justice Crawford's reasoning. Instead, the evidence that a match determination is inherently a matter of subjective judgment was reduced by Justice Crawford to two propositions:

> The [NRC] paper said that the examination steps taken by fingerprint experts using the ACE-V criterial were highly subjective and suggested specific measurement criteria could help *when the quality of fingerprint marks was reduced*.[104]

The highlighted portion of this proposition reflects an argument made by the Crown witnesses and Crown counsel, but this caveat does not appear within the *NRC Report*. Overwhelmingly, the trial judgment formulates claims about the shortcomings of fingerprint comparison as a matter of defence counsel advocacy, rather than scientific research and expert evidence.[105] The substantial evidentiary basis introduced to ground this argument is not documented within the verdict. Justice Crawford does not expressly set out how he resolved disagreements among the expert witnesses, although it is implicit in his acceptance of the fingerprint examiners' conclusion that he was satisfied that this particular match conclusion was sufficiently reliable to exclude reasonable doubt.

These examples hint at the extent to which Justice Crawford's reasons for judgment failed to explain why the trial judge resolved disagreement among the expert witnesses in favour of the Crown's position. The judgment refers to 'two outstanding experts' (Wilkinson and Cole) who provided expert testimony about matters that, the judgment implies, were ultimately largely beside the point.[106] Instead, Justice Crawford held that he was satisfied the fingerprint examiners' experience, qualifications and asserted confidence in their conclusions provided a sufficient basis to conclude beyond reasonable doubt that the crime scene latent was made by Bornyk.[107]

Justice Crawford's reliance on the experience and professed confidence of the RCMP examiners runs counter to the conclusions of each of the scientific reports. For example, the *PCAST Report* warns:

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104 *Bornyk* retrial judgment, *supra* note 1 at para 88 [emphasis added].

105 *Ibid* at para 120.

106 *Ibid* at para 8.

107 *Ibid* at paras 139, 142.

> neither experience, nor judgment, nor good professional practices (such as certification programs and accreditation programs, standardized protocols, proficiency testing, and codes of ethics) can substitute for actual evidence of foundational validity and reliability ... Similarly, an expert's expression of *confidence* based on personal professional experience or expressions of *consensus* among practitioners about the accuracy of their field is no substitute for error rates estimated from relevant studies. For forensic feature-comparison methods, establishing foundational validity based on empirical evidence is thus a *sine qua non*. Nothing can substitute for it.[108]

This passage was put before Justice Crawford, and Wilkinson acknowledged that she regarded the PCAST Report as authoritative. The retrial judgment does not document these facts, nor explain why he ultimately rejected the expert evidence on this point.

ii) Grappling with the risk of error in fingerprint identification

Justice Crawford's reasons indicate that Crown counsel had cited *Villaroman* in argument before him.[109] Justice Crawford characterized the relevant principles that emerge from *Villaroman* as follows:

> in a circumstantial case, evidence must be consistent with guilt and inconsistent with any other rational conclusion for a conviction to ensue and for something to be proved beyond a reasonable doubt. The trier of fact should not jump to conclusions or fill in blanks in a circumstantial case; a jury should be instructed that an inference of guilt from circumstantial evidence should be the only reasonable inference for such evidence and a reasonable doubt must be reasonable given the evidence and absence of evidence assessed logically and in light of human experience and common sense but the Crown need not negative speculation. Emphasis must be placed on determining whether or not the evidence as a whole establishes the accused's guilt. [110]

Notably, Justice Crawford omits from this account Justice Cromwell's statement that

> Requiring proven facts to support explanations other than guilt wrongly puts an obligation on an accused to prove facts and is contrary to the rule that whether there is a reasonable doubt is assessed by considering all of the evidence.[111]

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108 PCAST Report, *supra* note 52 at 6 [emphasis in original].

109 *Bornyk* retrial judgment, *supra* note 1 at para 132.

110 *Ibid*.

111 *Villaroman*, *supra* note 95 at para 35. See also *R v Robinson*, 2017 BCCA 6 at para 38, aff'd 2017 SCC 52 "substantially for the reasons of the majority in the Court of Appeal".

In *Bornyk*, defence counsel relied on the alternative hypothesis that someone other than Bornyk made the crime scene latent. The defence introduced evidence[112] and pointed to gaps in the Crown's case[113] to support its argument that this alternative inference was reasonable and had not been disproven by the Crown. It was integral to the defence case that the risk of error in fingerprint identification is real, and that it is higher than the RCMP witnesses acknowledged.

Justice Crawford observed at two places in his judgment that the fingerprints "were not directly attacked" and that "[n]o attack has been made on the fingerprints."[114] We find it difficult to know precisely what Justice Crawford intended by this statement, because (as we have related) the reliability of the RCMP's match conclusion was subjected to sustained challenge. One possible interpretation is that Justice Crawford intended to suggest that there was no specific evidence that a particular person other than Bornyk left the partial print, and no evidence from a fingerprint examiner opining that the two prints did not match. This possible reading is, to some extent, complicated by this paragraph from the verdict:

> No attack has been made on the fingerprints themselves. Nor has the defence questioned the accuracy of the examiners' assessment who say that the print is of high quality and that there are 20 or more common characteristics between the latent print and Mr. Bornyk's source print. Nor have I been pointed to any discrepancy in the fingerprints that would lead me to believe that either of the two highly qualified examiners made an error in judgment.[115]

This paragraph seems to look to the defence to point to particular kinds of problems with the match determination. It certainly implies that Justice Crawford may have accepted evidence of a significant discrepancy as raising a reasonable doubt. In sum, this paragraph lists some specific ways in which, Justice Crawford suggests, the match determination was *not* challenged. Justice Crawford's conclusion that the print was of high quality, and no significant discrepancies were identified are linked in ways we will describe below. The proposition that the two prints had 20 or more common characteristics will also be discussed further.

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112 This evidence included Cole's testimony and cross-examination of Wilkinson, extracts from the reports themselves, evidence of specific shortcomings in the practices of the RCMP examiners in this case, and cross-examination on apparent dissimilarities between the crime scene latent and Bornyk's known prints and on possible sources of bias.

113 See e.g. the failure of the RCMP to take fingerprints from those who had legitimate access to the object on which the print was found.

114 *Bornyk* retrial judgment, *supra* note 1 at paras 8, 137.

115 *Ibid* at para 137.

Wolbeck testified at some length about the quality of the crime scene latent. He identified areas of distortion within the print but concluded that "a vast majority of the impression is free of the effects of lateral distortion and our clarity remains very good."[116] Wolbeck characterized the partial crime scene latent as 'high quality' and explained that with a high quality impression, the examiner's tolerance for discrepancies between crime scene latent and reference print should be low.[117] When cross-examining Wolbeck, defence counsel Ray implicitly accepted that a defined portion of the crime scene latent was of high clarity. However, the defence also relied on Cole's testimony that the determination of clarity is subjective and that research has found that examiners differ as to their confidence in the clarity of minutiae within corresponding portions of the same latent print.[118]

Wolbeck agreed on cross-examination[119] that the following passage from a leading textbook of fingerprint examination properly explained the principles that apply regarding tolerance for discrepancies in a high quality print:

> if the print is a cyanoacrylate print with no signs of deposition pressure or pressure distortion … all friction ridge details compared should appear similar or there must be a very clear reason why.[120]

Wilkinson testified that Canadian fingerprint examiners are taught that "if you see a … discrepancy that cannot be explained, you have to conclude an exclusion."[121]

When taken in cross-examination to an apparent discrepancy within the clear area of friction ridge as between the crime scene latent and the reference print, Wolbeck testified that even a very clear impression will not be 'pristine' and that "there will be some differences, that's not unexpected."[122] Presented with another apparent discrepancy, Wolbeck

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116 *Bornyk* Retrial Transcript, *supra* note 20 at 15 (24 January 2017).

117 *Ibid* at 22–23.

118 *Ibid* at 10–12 (Closing address, Jeffrey Ray, 30 January 2017, relying on Cole's evidence regarding R Austin Hicklin et al, "Latent Fingerprint Quality: a Survey of Examiners" (2011) 61:4 J Forensic Identification 385).

119 *Ibid* at 59 (24 January 2017).

120 David R Ashbaugh, *Quantitative-Qualitative Friction Ridge Analysis: An Introduction to Basic and Advanced Ridgeology* (Boca Raton, Fla: CRC Press, 1999) at 45.

121 *Bornyk* Retrial Transcript, *supra* note 20 at 33 (25 January 2017). This was broadly consistent with international practices, but the fundamental issue is the lack of consistency surrounding the individual examiner's "explanation" or basis regarding distortion or lack of distortion.

122 *Ibid* at 67 (24 January 2017).

testified that this difference was attributable to a difference in "deposition pressure."[123] When challenged on the basis that this answer was inconsistent with his previous testimony that there was no distortion due to deposition pressure,[124] he said "[y]ou'll never get deposition pressure exactly the same. There's always going to be some difference."[125] Taken to a third apparent discrepancy, he testified that "this is a three dimension to a two dimensional impression issue."[126] (This explanation refers to the distortion that may arise when a three-dimensional fingertip leaves a two-dimensional impression on a flat object). In summary, Wolbeck declared "[t]hese differences do not cause me any great concern."[127] When asked a further question by Justice Crawford, Wolbeck offered "[t]here are reasons why there might be appearances or variances in appearance. But the characteristics, the minutiae within that fingerprint, there's ample quantity and quality of that information."[128] Wolbeck had not documented these differences in his report or bench notes, nor had he documented his reasons for being satisfied that they did not threaten the match conclusion at any point before the retrial.

In his verdict, Justice Crawford summarized this testimony and stated:

> He said while the latent print had some differences, the small gaps gave him no concern as the ridge markings were comparable … Any variations in his opinion related to the translation of a 3D print to a 2D photo but did not give him concern.[129]

Cole testified about the potential significance of visible differences between a crime scene latent and a reference print. He observed, as a matter of principle, that "all prints, even from the same source, look different from one another."[130] Cole explained that the fingerprint examiner community has 'no formal rules' or protocol to distinguish between explicable differences and those that cannot be explained.[131]

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123 *Ibid* at 68.

124 *Ibid* at 14 (Wolbeck's evidence in chief on this point was "deposition pressure can change somewhat throughout the impression, depending on how it's handled. However, in this case, the impression is fairly consistent with being held with normal type of pressure. And we can see on the next page that our friction ridges and our furrow are approximately the same size").

125 *Ibid* at 68.

126 *Ibid*.

127 *Ibid* at 69.

128 *Ibid* at 74–75.

129 *Bornyk* retrial judgment, *supra* note 1 at paras 66–67.

130 *Bornyk* Retrial Transcript, *supra* note 20 at 7 (26 January 2017).

131 *Ibid* at 8–9. This is a problem that extends beyond the RCMP's fingerprint comparison to the international community of fingerprint examiners.

This lack of rules introduces subjectivity into the process of determining whether two prints that exhibit dissimilarity were made by the same person.[132] Cole's report, which was tendered as evidence, also explained that within the fingerprint examiner community "it is now argued that even an unexplainable dissimilarity may be trumped by a great number of similarities. Precisely how many similarities outweigh a dissimilarity remains likewise a subjective decision."[133] Cole explained that relying upon subjective judgment of adequacy is not "completely unreliable" but "in general in science objective measurement is preferred if it's possible."[134] Ultimately, Cole's evidence suggested that the court should be cautious about relying on impromptu explanations (or post hoc rationalisations) for visible differences between two prints.

Defence counsel relied on Cole's report and testimony when he submitted "it's up to Your Lordship to determine whether the dissimilarities are present … such that the spectre arises of a misidentification."[135] Crown counsel acknowledged that dissimilarities could be observed between the prints but emphasized the expertise of latent print examiners when he reminded the trial judge that neither lawyer is a fingerprint examiner. He submitted that Wolbeck was "easily able to explain those dissimilarities."[136] In his verdict, Justice Crawford summarized Cole's testimony that two impressions made from the same finger "can have dissimilarities."[137] He also stated that Cole "noted that the literature notes that an unexplainable dissimilarity may be trumped by a great number of similarities."[138] However, the judgment does not convey that Cole characterizes this notion as a matter of conjecture rather than empirically validated practice. Indeed, the verdict does not convey what we understand to be the central point of Cole's evidence about variation in the appearance of prints—that the judgment as to whether apparent differences can be explained is made subjectively and without formal rules or protocols, and that particular risks of post-hoc justification arise where differences are not documented along with the examiner's judgment as to their significance at the time when the two prints are first being compared.

In the result, as we have seen, the trial judge held that he had not "been pointed to any discrepancy in the fingerprints that would lead me to believe that either of the two highly qualified examiners made an

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132 *Ibid* at 8.

133 *Ibid* at 5 (Simon Cole, *R v Bornyk*, expert report 3 November 2016, original citation omitted).

134 *Ibid* at 8 (26 January 2017).

135 *Ibid* at 12 (30 January 2017).

136 *Ibid* at 27.

137 *Bornyk* retrial judgment, *supra* note 1 at para 102.

138 *Ibid*.

error in judgment."[139] Implicit within this statement is a rejection of the defence proposition that the explanations supplied by Wolbeck for the acknowledged differences were insufficient because they appeared to contradict his testimony on clarity and deposition pressure, and had not been documented when he undertook his comparison.[140] The verdict does not document these arguments nor explain why Justice Crawford resolved them in favour of the Crown.

It may be significant that Justice Crawford expressed his conclusion about discrepancies in the terms that nothing he heard "would lead me to *believe*"[141] that an error in judgment had occurred. The question for Justice Crawford was whether, on the basis of all of the evidence including the admitted presence of differences between the two prints, the Crown had proven beyond a reasonable doubt that the match determination was correct. Justice Crawford's formulation suggests that he may improperly have placed the burden of persuasion upon the defence, to a standard that required him to form a positive belief that an error had been demonstrated (as opposed to addressing the question of whether the comparison is less accurate, or more open to reasonable doubt, than previously recognised).

Justice Crawford also stated that the defence had not challenged the accuracy of the fingerprint examiners' assertion that they could identify 20 or more matching characteristics between the crime scene latent and Bornyk's reference print.[142] Wolbeck testified as to the process by which he identified distinctive characteristics within a crime scene latent, for example "I'm following the ridges as far as I can see them, noting characteristics as I come across them and what the ridges are doing on either side."[143] On cross-examination, he agreed that he had not documented the characteristics on which he relied when first analyzing the crime scene latent or during his comparison.[144] Wolbeck asserted that such documentation is only required in a complex case.[145]

Instead of documenting distinctive characteristics, Wolbeck testified that he made note of these characteristics "in my mind as I was proceeding through the analysis."[146] Wilkinson, by contrast, adopted on cross-examination a document that suggested that RCMP policy always requires

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139 *Ibid* at para 137.

140 *Bornyk* Retrial Transcript, *supra* note 20 at 62–63, 68–69 (24 January 2017); *Bornyk* Retrial Transcript, *supra* note 20 at 7–9, 13–14 (30 January 2017).

141 *Bornyk* retrial judgment, *supra* note 1 at para 137 [emphasis added].

142 *Ibid*.

143 *Bornyk* Retrial Transcript, *supra* note 20 at 21 (24 January 2017).

144 *Ibid* at 62.

145 *Ibid*.

146 *Ibid*.

an examiner to document salient features in the crime scene latent prior to turning to the reference print:

> Q … this is written.
> All forensic identification examiners in Canada are taught to detect reliable features such as ridge events, creases and scars in friction ridge impressions methodically, following the flow of one ridge before proceeding to the next until all discriminating features have been analyzed within the crime scene impression. Do you agree with that?
>
> A Yes, I do.
>
> Q It continues on:
> This information is documented prior to following an identical process to determine the discriminating features within an impression from a known source. Do you agree with that?
>
> A Yes, that would be what was in – what is in policy.
>
> Q And what is in training, correct?
>
> A Yes.[147]

Wilkinson testified that she was unaware that Wolbeck had failed to follow this policy.[148] Wilkinson also agreed that "there is a debate among experts as to what constitutes a non-complex versus a complex latent print."[149] She pointed to research that is intended to standardise this determination, but agreed that it was not yet being applied within RCMP practice and procedure. However, she also suggested that, in her opinion, documentation of the salient features within the crime scene print prior to looking at the reference print is most important when the quality or clarity of the crime scene print is low.[150]

Defence counsel relied on the *PCAST Report* and Cole's testimony to argue that failing to document the salient characteristics within the crime scene print prior to turning to the reference print "introduces a serious risk of confirmation bias."[151] The RCMP examiners' failure to document common characteristics at the time of their analysis was an important basis for the defence theory that confirmation bias may have arisen in

147 *Ibid* at 34–35 (25 January 2017).

148 *Ibid* at 36.

149 *Ibid*.

150 *Ibid* at 22.

151 PCAST Report, *supra* note 52 at 10. *Bornyk* Retrial Transcript, *supra* note 20 at 3 (Closing address, Jeffrey Ray, 30 January 2017).

this case. Justice Crawford summarised this argument in his decision, recording that defence counsel argued that by failing to document the common characteristics "Cpl. Wolbeck may have been influenced by looking at the known print or 'confirmation bias.'"[152] He also recorded that Wilkinson had "acknowledged that [while] the police are trained regarding bias, the reality is that bias can be subtle or subconscious."[153] He explained that both Wolbeck and McNaught "testified they were not biased"[154] and that Wolbeck "was aware of the concern about bias and said that it was reduced by the analysis process."[155] He also recorded that Wolbeck "agreed it would be better practise to document the latent print characteristics to prevent any argument as to him being biased upon seeing the known print."[156] Finally, Justice Crawford noted that the evidence before him suggested "when the mark is rich in information, the risk that bias will significantly impact judgment is limited"[157] but also that "the presence of the potential source comparison print affect[s] the number of characteristics annotated."[158]

Justice Crawford's account of the evidence conveys that a serious question was raised at trial about Wolbeck's failure to document the distinctive features within the crime scene latent prior to looking at the reference print. The decision does not, however, record that Justice Crawford received the following conclusion from the *PCAST Report*:

> As a matter of scientific validity, examiners must be required to 'complete and document their analysis of a latent fingerprint before looking at any known fingerprint' and 'must separately document any data relied upon during comparison or evaluation that differs from the information relied upon during analysis.'[159]

The *PCAST Report* emphasises that these rules "need to be universally adopted by all laboratories."[160] PCAST did not qualify this recommendation by reference to the quality or clarity of the crime scene latent.

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152 *Bornyk* Retrial Transcript, *supra* note 20 at 112.

153 *Ibid* at 116.

154 *Ibid* at 129.

155 *Ibid* at 56.

156 *Ibid* at 70.

157 *Ibid* at 130.

158 *Ibid* at 95.

159 PCAST Report, *supra* note 52 at 100 citing Bradford T Ulery et al, "Changes in latent fingerprint examiners' markup between analysis and comparison" (2015) 247 Forensic Science Intl 54.

160 PCAST Report, *supra* note 52 at 100 (It is apparent from the report and the cited study that the documentation intended by the authors is documentation of the distinguishing features within the crime scene latent).

The *PCAST Report* also recommended that:

> courts should assess the measures taken to mitigate bias during casework—for example, ensuring that examiners are not exposed to potentially biasing information and ensuring that analysts document ridge features of an unknown print before referring to the known print.[161]

These recommendations were in evidence before Justice Crawford and were relied upon by the defence during witness examination and closing submissions. Nor does Justice Crawford record Wilkinson's evidence that Wolbeck's failure to document the salient features within the crime scene latent prior to looking at the reference print contravened RCMP training and policy. He does, however, note McNaught's testimony that RCMP policy "doesn't state that I have to write out all of which I see or the location in the print in which I see them."[162]

The trial judge was thus presented with contradictory evidence about standard RCMP practice with respect to documenting features alongside evidence that formal RCMP policy and an authoritative report—which was expressly accepted by RCMP's research scientist—emphasizes the importance of documenting the features within the crime scene print prior to looking at the reference print. It is clear from the *PCAST Report* that assertions about the number of matching characteristics between the two prints are questionable without such documentation.[163] However, Justice Crawford ultimately concluded that the examiners' apparent failure to follow RCMP policy and training did not contribute to raising a reasonable doubt about the reliability of their match determination.[164] Although he may have had good reasons for (implicitly) rejecting the *PCAST Report's* strongly worded recommendation and for overlooking the apparent breach of RCMP policy, he does not provide those reasons.

The judgment refers several times to the assertion that the examiners had identified 20 or more common characteristics between the two prints, and Justice Crawford ultimately accepted this evidence.[165] Wilkinson testified about the significance of the asserted number of common characteristics. She described a study conducted by researchers in the UK to quantify "the weight of evidence" for fingerprint

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161 *Ibid* at 101.

162 *Bornyk* Retrial Transcript, *supra* note 20 at 73 (25 January 2017). See *Bornyk* retrial judgment, *supra* note 1 at para 86.

163 PCAST Report, *supra* note 52 at 102. Consider the disagreement about the sufficiency of a print for comparison and the number of points discernible in the English case of *R v McNamee*, [1998] 12 WLUK 408.

164 *Bornyk* retrial judgment, *supra* note 1 at para 142.

165 *Ibid*.

comparison.[166] This impressively designed study was conducted on the premise that "the evaluation of the weight of evidence associated with any particular fingerprint comparison lacks both a scientific foundation and transparency."[167] The authors cite Cole's work with approval in acknowledging a problem of "overstatement of the evidence" in fingerprint identification.[168] This study constitutes a significant contribution towards establishing a quantitative approach to estimating the weight of evidence for a fingerprint identification in a manner that is broadly analogous to the reporting of DNA analysis.[169] However, the authors acknowledged here and in a related paper that the reference database they used to calculate probability densities "has not been validated to serve as a reference database for casework purposes."[170] In short, while this research is encouraging, it is not yet ready to be used in real cases.

Wilkinson described the study at some length in her testimony. She suggested that it was significant because it showed that fingerprint impressions are 'highly discriminating' and that the value of a fingerprint identification broadly increases as the number of minutiae—or features—identified within a print increases.[171] Wilkinson stated that the likelihood ratios generated in the Neumann et al study were reassuring with respect to the reliability of fingerprint examination as 'practiced in Canada'[172] but explained that the study warned against a simple translation from number of matching features (aka minutiae) to likelihood ratio:

> The fact that … there's a big spread of data, speaks to the fact that the fingerprint examiner has to consider the rarity of the information … [C]ertain 11 minutiae configurations offer no more discriminating ability than a five minutiae configuration.[173]

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166 *Bornyk* Retrial Transcript, *supra* note 20 at 7–13 (25 January 2017, citing Cedric Neumann, Ian W Evett, & James E Skerrett, "Quantifying the weight of evidence from a forensic fingerprint comparison: a new paradigm" (2012) 175:2 J Royal Statistical Society Series A: Statistics in Society 371 [Neumann et al, *A New Paradigm*].

167 Neumann et al, *A New Paradigm*, *supra* note 166 at 372.

168 *Ibid*.

169 *Ibid* at 372–73.

170 Cedric Neumann et al, "Quantitative assessment of evidential weight for a fingerprint comparison I. Generalisation to the comparison of a mark with set of ten prints from a suspect" (2011) 207 Forensic Science Intl 101 at 102 [Neumann et al, *Ten Print*]. In Neumann et al, *A New Paradigm*, *supra* note 166 at 412, the authors acknowledge that "the questions of the size and representativeness of the reference database that is used in the model and of the influence of ethnicity, gender and relatedness on friction ridge features need to be addressed".

171 *Bornyk* Retrial Transcript, *supra* note 20 at 12 (25 January 2017).

172 *Ibid* at 13.

173 *Ibid*.

Wilkinson explained that quantifying the rarity of minutiae is an important step. However, she did not explain the authors' express caveat against applying the numbers generated in this study to real criminal casework.[174] Cole did warn the *Bornyk* court against using the Neumann et al study in this way.[175]

Wilkinson did not make the error of seeking to apply the numbers in the Neumann et al study directly to this case, but Crown counsel did. In his closing address, he submitted:

> The chart … show a probability of the latent and known prints coming from the same source to be between one billion and one quintillion when the latent print had 12 characteristics and Dr. Wilkinson testified that the probabilities were even higher when the study considered prints with quantity of minutiae … of at least 20.[176]

The trial judge referred to Crown counsel's submission in his decision when he observed:

> With respect to the reliability of the findings, [Crown] counsel referred to the Neuman likelihood ratio study showing the quantity and clarity of the characteristics or features of a fingerprint, which substantially increased the probability of a latent and known print being the same to between one billion and 1.2 billion when the latent print had 12 characteristics. It was noted both examiners had found at least 20 common characteristics between the latent and known prints.[177]

It appears from the overall judgment that Justice Crawford accepted this estimate of the likelihood of an adventitious match.

The trial judge's decision to rely upon the Neumann et al study in this way is important because it goes to the heart of the defence criticism of the fingerprint examiners' testimony. The defence submissions emphasized the unreliability of post-hoc minutiae identification when the examiners had not documented the minutiae on which the match declaration was originally based. The defence relied upon scientific reports that document the risk of confirmation bias that arises from such a process. This context differs vastly from the Neumann et al study, in which discriminating

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174 Neumann et al, A New Paradigm, *supra* note 166 at 393 (Neumann and co-authors point to specific demographic reasons why the database may well *not* be representative); See also Neumann et al, "Reply" published in Neumann et al, *A New Paradigm*, (2012) 175 J Royal Statistical Society Series A: Statistics in Society 410 at 412.

175 *Bornyk* Retrial Transcript, *supra* note 20 at 12 (27 January 2017).

176 *Ibid* at 35 (30 January 2017).

177 *Bornyk* retrial judgment, *supra* note 1 at para 128.

minutiae were documented as part of the original ACE-V procedure in accordance with PCAST's endorsed practice.[178]

While the judgment is slightly unclear, it appears that the trial judge accepted that the Neumann et al study established that the odds against finding at least 12 matching minutiae between the crime scene latent and a random reference print were between one billion and 1.2 billion to one.[179] If accepted, this statistic makes the defence submission that the Crown had failed to disprove the hypothesis that someone else had made the crime scene latent seem far more speculative—with these numbers, one can make an analogy to the random match probabilities frequently used in DNA evidence. However, if this was Justice Crawford's reasoning, he made a serious error by overlooking both the limitations of the Neumann et al study and the divergence between the Neumann et al methodology and the practice of fingerprint examination in this case.

A leading Canadian report on the limitations of expert evidence and the challenges of effective communication was written by Justice Stephen Goudge in his review of the wrongful convictions of parents and caregivers in Ontario.[180] In his report, Goudge explains:

> When the opinions of forensic pathologists, including their limitations, are not properly understood, the justice system operates on misinformation. This breakdown in communication may have serious and sometimes disastrous consequences for the administration of justice and those most affected by it[.][181]

Goudge's report focused on the work of forensic pathologists, but it has been accepted by judges as bearing upon the work of all experts within the legal system.[182] By analogy, if Justice Crawford did not properly understand the nature and limitations of the Neumann et al study, but relied in part on a misunderstanding of that study in his decision to convict Bornyk, he arguably operated on the basis of misinformation. As Goudge emphasized, the responsibility for preventing such a scenario is shared by expert witnesses, lawyers and the trial judge. Still, as the complex statistical analysis provided in the Neumann et al study illustrates, it is not always easy for these participants—working singly or collectively—to

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178 See Itiel Dror et al, "Cognitive issues in fingerprint analysis: Inter- and intra-expert consistency and the effect of a 'target' comparison" (2011) 208 Forensic Science Intl 10 (Other research suggests that there is considerable variation among examiners in the selection of minutiae).

179 *Bornyk* retrial judgment, *supra* note 1 at para 128.

180 Goudge, *supra* note 14 (Edmond was an adviser to the Goudge Inquiry).

181 *Ibid*, vol 3 at 406.

182 *White Burgess*, *supra* note 3 at para 12; *Bedford v Canada (AG)*, 2013 SCC 72 at para 53; *Abbey*, *supra* note 91 at para 64.

avoid such errors. We question whether the Crown should have relied so heavily on evidence based on complex statistical reasoning without calling a statistician—ideally one of the study authors—to explain the findings and limits of the study.

We have already discussed our concerns about Justice Crawford's conclusion that he had not been pointed to discrepancies that "would lead me to believe that either of the two highly qualified examiners made an error in judgment."[183] While demonstrating dissimilarities between a crime scene latent and reference print certainly offers one possible means of raising a reasonable doubt, pressing the Crown to address the risk of error inherent to the field, technique or case-specific work is another.[184] As Justice Crawford records, Wolbeck retreated from his original assertion that "there's no errors allowed in fingerprint identification."[185] At the retrial, he testified instead that he had never been told in training or proficiency testing that he had made an erroneous identification (and that such errors would routinely be communicated).[186] Justice Crawford notes that Wolbeck's "testimony regarding infallible certainty had changed over the course of the trial process to reflecting the RCMP awareness of some of the academic concerns" about overclaiming.[187]

We have previously quoted PCAST's conclusion that fingerprint examination as a field is foundationally valid "albeit with a false positive rate that is substantial and is likely to be higher than expected by many jurors based on longstanding claims about the infallibility of fingerprint analysis."[188] PCAST concluded that evidence of a match determination should be accompanied by information about error rates "that could be as high as 1 error in 306 cases in one study and 1 error in 18 cases in the other."[189] The *PCAST Report* states that until further studies are conducted, "claims of higher accuracy [than this] are not warranted or scientifically justified."[190]

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183 *Bornyk* retrial judgment, *supra* note 1 at para 137.

184 See *JLJ*, *supra* note 3 at paras 51–55; *Trochym*, *supra* note 3 at paras 41–46.

185 *Bornyk* retrial judgment, *supra* note 1 at para 103.

186 *Ibid* at paras 30, 71, 103.

187 *Ibid* at para 103.

188 PCAST Report, *supra* note 52 at 101.

189 *Ibid* at 101.

190 *Ibid* at 102. Wilkinson et al, *supra* note 66 at 315 (In line with the fingerprint community, Wilkinson and her co-authors contend that the estimation of error rates is dangerously misleading); Organization of Scientific Area Committees Friction Ridge Subcommittee, *Response to Call for Additional References Regarding (PCAST Report)* (14 December 2016), online (pdf): <www.nist.gov>. But see PCAST, *An Addendum to the PCAST Report on Forensic Science in Criminal Courts* (6 January 2017) at 7, online (pdf):

Justice Crawford heard a great deal of evidence regarding error rates and how general studies such as those reported by PCAST should be interpreted within the context of a specific match determination. The challenges associated with reasoning from population-level statistics to a single case are well described within the legal literature on statistical evidence.[191]

In *Bornyk*, once the Crown strategy shifted to acknowledging that mistakes can be made in fingerprint evidence and that errors have been documented, the next logical question was how best to assess the risk of error in this case. We have already seen that the Crown strategy was to emphasize the clarity of the crime scene latent and to argue that the risk of error is lower when the latent print is of higher quality. Indeed, Wilkinson testified that the two studies relied upon by PCAST "only focus on difficult comparisons … They use the most difficult quality fingerprint impressions that we would expect to see in casework."[192] In cross-examination, Ray took Wilkinson to the appendix to the FBI black box study—one of the two studies relied upon by PCAST. The authors had asked the study participants to estimate the difficulty of the examinations they completed. The vast majority (85%) estimated the difficulty to be 'similar' to that found in casework.[193] Eventually, defence counsel asked Wilkinson the following question, and elicited the following response:

> Q Would you agree with me that in determining whether the latent known fingerprint comparisons in the Ulery FBI study was difficult or not, the best people to ask were the people who participated in it?
>
> A Yes, I agree.[194]

For its part, the defence relied upon PCAST's estimate of error rates and emphasized PCAST's statement that "claims of higher accuracy … are not warranted or scientifically justified."[195] In his testimony, Cole pointed

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<obamawhitehouse.archives.gov>; *Bornyk* Retrial Transcript, *supra* note 20 at 17–19 (Wilkinson's testimony, 25 January 2017).

191 For an overview, see David L Faigman, "Evidentiary Incommensurability - A Preliminary Exploration of the Problem of Reasoning from General Scientific Data to Individualized Legal Decision-Making" (2009) 75 Brook L Rev 1115.

192 *Bornyk* Retrial Transcript, *supra* note 20 at 16–17 (25 January 2017).

193 Bradford T Ulery et al, "Accuracy and Reliability of Forensic Latent Fingerprint Decisions" (2011) 108 Proceedings National Academy Science: Applied Biological Sciences 7733 Appendix: Supporting Information at 4. See *Bornyk* Retrial Transcript, *supra* note 20 at 51.

194 *Bornyk* Retrial Transcript, *supra* note 20 at 51 (25 January 2017). See also *Bornyk* Retrial Transcript, *supra* note 20 at 14 (Cole's Response, 27 January 2017).

195 PCAST Report, *supra* note 52 at 101–02.

to the fact that Wolbeck had reported his match conclusion without providing any indication of error rates.[196] Cole testified that "it would not be okay … if the examiner is going to claim that … the error rate is somehow less than what it said here in the [*PCAST Report*]."[197]

Crown counsel specifically put to Cole the criticism that, by emphasizing average error rates, the PCAST recommendation might cause courts to undervalue identifications based on high quality prints. Cole's response to this suggestion illuminates the difference between the defence approach to this literature and that propounded by the Crown:

> [The principle] that a kind of mismatch between the quality of the evidence in a study and the quality of the evidence in a case could cause one to either undervalue or overvalue the evidence is, of course, true as a matter of—of principle. The—I don't quite agree with the implication that PCAST's recommendation is necessarily wrong, since what PCAST is doing is recommending that the best available information be conveyed to the fact-finder, and *that is the best available information at this point*.[198]

In his closing submission, defence counsel summarised the evidence that Cole and Wilkinson had given and reminded the trial judge of PCAST's statement that claims of higher accuracy are not justified before arguing:

> Regardless, My Lord, of whether the error rate is one in 18, one in 66, one in 306, the simple fact remains that there are errors made, and in my respectful submission that factor must be first and foremost in Your Lordship's mind when you consider the opinions of Corporal Wolbeck and Sergeant McNaught.[199]

Crown counsel emphasized the testimony that the court had heard about the clarity and high quality of the crime scene latent and submitted that an error is more likely to arise where a print is of lower quality. He characterised this claim as "really almost a matter of common sense."[200]

In his verdict, Justice Crawford summarised some aspects of Wilkinson and Cole's testimony. However, while recording Wilkinson's

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196 *Bornyk* Retrial Transcript, *supra* note 20 at 5 (26 January 2017).

197 *Ibid* at 34.

198 *Ibid* at 17 [emphasis added]. (When cross-examined about how PCAST had approached the estimate of error rates that was most vehemently criticized by the RCMP and others in the fingerprint examiner community, Cole responded "I agree with PCAST, which says clearly that it's inappropriate to remove clerical errors in a study like this. And I reached that conclusion independently myself and published articles making that argument" *Ibid* at 18).

199 *Ibid* at 12 (30 January 2017).

200 *Ibid* at 30.

assessment of the 'true' error rate emerging from the studies,[201] he did not, for example, report Cole's testimony that the PCAST approach to error rates should be preferred to Wilkinson's approach—nor did he identify that the *PCAST Report* provides guidance on this point. Instead, he stated in a single paragraph "I do not propose to go through all of the evidence and reports put before me."[202] Ultimately, the only clear finding that Justice Crawford makes about the possibility of error in this case is his conclusion that he had not been pointed to discrepancies that would make him believe that an error had occurred.[203]

The dispute regarding error rates and how they should be applied in the circumstances of this case illuminates the difficulties that arise when a court is presented with conflicting evidence about the proper resolution of a debate in a field in which judges and lawyers have no particular professional expertise. The statistical evidence relied upon in this case was complex, and the underlying epistemological challenge of how best to apply quantitative studies to an individual case is one that has dogged evidence scholars and courts alike.[204] In most cases, such debates can be resolved by supplementing the statistical evidence with other inculpatory or exculpatory evidence. In *Bornyk*, this strategy was unavailable because the only evidence of guilt was the claimed match between the crime scene print and reference print, and the statistical evidence bore directly on the probative value and prejudicial risk of that claim.

iii) Individualization and the alternative perpetrator hypothesis

As we have previously described, the defence theory of this case had two strands. The second strand was that the Crown had failed to exclude alternative possible donors of the crime scene latent. In his closing submissions, defence counsel emphasized that the RCMP had not fingerprinted those with innocent access to the collectible doll from which the print was recovered, including individuals such as the home owners who were readily identifiable and already participating in the investigation. Ray also pointed to the fact that Wolbeck had not dusted the other collectible dolls that formed a set with the one on which the crime scene latent had been found. These other dolls had not been disturbed

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201 *Bornyk* retrial judgment, *supra* note 1 at para 96.

202 *Ibid* at para 109.

203 *Ibid* at para 137 (In many cases there will be no evidence that an error has occurred because the correct answer is simply unknown. Not having made an error and not knowing that you have made an error are conceptually distinct).

204 See e.g. David Faigman, John Monahan & Christopher Slobogin, "Group to Individual (G2i) Inference in Scientific Expert Testimony" (2014) 81:2 U Chicago L Rev 417.

during the break and enter, and so finding a matching fingerprint on one of these dolls would have tended to support the hypothesis that the prints were not made in the course of the break and enter.[205] Given that a single print was found in a scene that had been thoroughly ransacked, and alternative sources for this print had not been excluded, Ray suggested that it was reasonable to hypothesize that the true perpetrator had worn gloves.[206] In short, the defence argued, the apparent match between the partial crime scene latent and the reference print may be adventitious.

The alternative perpetrator hypothesis was closely tied into the defence theory that the RCMP's fingerprint examination practices were prone to confirmation bias and therefore raised a real risk of error. It was specifically in response to this hypothesis that Crown counsel argued that the data from the Neumann et al study showed a probability of coincidental correspondence higher than one quintillion.[207] Crown counsel also noted that Bornyk was found in the city where the crime occurred, two weeks after the crime took place.[208] Relying on the apparently overwhelming weight of a match determination with these characteristics, Crown counsel did not address the defence argument that the RCMP had failed to investigate alternative potential donors of the crime scene latent and to consider the potential for cognitive bias within the RCMP's ACE-V process and subsequent defence of its work in this case.

Justice Crawford's verdict does not address the second strand in the defence theory until after he has accepted Wolbeck and McNaught's match determination. The decision then states:

> While the defence argued it was odd that only one print was found in such a badly ransacked house, the only rational explanation as to why Mr. Bornyk's right index fingerprint would show on the plastic wrapper of the Living Dead doll was because he held the box during the break in on the night of 6-7 July, 2010.
>
> In sum, in the circumstantial case I have before me, clear evidence from experts identifies the latent print as Mr. Bornyk's. The only rational explanation is that the person who broke and entered the Porritts' house on the night of July 6–7, 2010, was Mr. Bornyk. I am satisfied of his guilt beyond a reasonable doubt.[209]

Having accepted that the crime scene latent is Bornyk's print, Justice Crawford relied on his conclusion about the correctness of this identification to address the defence concerns about the inherent

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205 *Bornyk* Retrial Transcript, *supra* note 20 at 18 (30 January 2017).

206 *Ibid* at 17–18.

207 *Ibid* at 35.

208 *Ibid* at 36.

209 *Bornyk* retrial judgment, *supra* note 1 at paras 143–44.

improbability of finding a single partial latent in a thoroughly ransacked home.

Justice Crawford accepts that the match determination in this case constitutes an individualization—that is, a conclusion that only Bornyk could have made the crime scene latent. Challenging the fingerprint examiner community's assertion that it is capable of individualization has been a core theme of Cole's published work,[210] and this challenge was the subject of evidence at trial. Wolbeck relied upon published standards for the fingerprint examiner community when he testified that:

> identification is the determination that the two compared impressions originated from the same source.
>
> Now, My Lord, to be fair, I cannot practically compare every fingerprint that ever has existed in the past, currently exists or will exist in the future to the known - to the latent impression. It's not practically possible. So there is a theoretical possibility that this formation may exist sometime in the past, present or future, but based on the amount of agreement between the friction ridges that I have, in my opinion, it is very unlikely [for] that to occur.[211]

Wolbeck was cross-examined about whether he was able to form a decision of individualization based on a single, partial latent. He agreed that there are no scientific standards published that establish the minimum information content necessary to individualize, but strongly defended his capacity to reach his decision to individualize in this case based on his training and experience.[212]

Cole, in turn, explained to the court:

> a claim of individualization to reduce the donor pool to a single person is scientifically unsupportable. [That realisation] … has been increasingly adopted within the fingerprint community itself.[213]

He also testified that there is no empirical basis for an examiner "to say that they know that the probability that the two prints come from different sources is a practical impossibility."[214] Cole was not cross-examined on these points.

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210 Perhaps most notably, Cole, *Individualization*, *supra* note 22 (This article has been widely and positively cited, including within articles relied upon by the Crown in this case).

211 *Bornyk* Retrial Transcript, *supra* note 20 at 44 (24 January 2017).

212 *Ibid* at 61.

213 *Ibid* at 36 (26 January 2017).

214 *Ibid*.

On Cole's evidence, even if the Court accepted that the crime scene latent and reference print were the same in every aspect of their discernible characteristics, and that any apparent differences were properly explained, there is no empirical evidence to support the assertion that no other person's prints could have made an impression containing a matching pattern. Cole testified that this analysis was endorsed by the *NRC Report,* which concluded that except for DNA, "no forensic method has been rigorously shown to have the capacity to consistently or with a high degree of certainty demonstrate a connection between evidence and a specific individual or source."[215]

The *NIST Report* provides a fascinating worked statistical example to demonstrate 'just how ambitious' fingerprint examiners' claim to individualization is. This example shows that even if the odds of two prints appearing so similar as to be declared a match are one in a trillion, the expected number of indistinguishable prints from different sources would be 25 million in a world population of 7 billion.[216] Cole alluded to this analysis (though he did not quote it) in his evidence.[217]

Justice Crawford rejected this evidence:

> What is fundamental is that fingerprints are highly individualized. While it may be statistically possible that one set of fingerprints is similar to fingerprints from another person in the world, no evidence was laid in front of me that there is a person with identical fingerprints to another, not even identical twins.[218]

In making this finding, he did not refer to the conclusions reached within the scientific reports or to Cole's testimony, nor explain why he had rejected the scientific literature that is strongly critical of claims to individualization. Indeed, in this paragraph, Justice Crawford again seems to place the burden of positively proving the alternative hypothesis on the defence—and to misunderstand the statistical reasoning that provided the basis for the defence submission. As the structure of his reasons illustrates, Justice Crawford's reliance on the 'fundamental' principle of individualization made it a short step from accepting the correctness of the fingerprint examiners' declared match to rejecting the plausibility of the defence's alternative perpetrator hypothesis.

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215 *Ibid* at 25 (26 January 2017, citing *NRC Report*, *supra* note 29 at 7).

216 NIST Report, *supra* note 31 at 16.

217 *Bornyk* Retrial Transcript, *supra* note 20 at 2 (27 January 2017).

218 *Bornyk* retrial judgment, *supra* note 1 at para 140.

5. Institutional limits

In a 2009 article reflecting on some of his experiences testifying as an expert witness in US criminal proceedings, Cole cautioned that 'it is simplistic to think that the appropriate measure of success' for an expert witness is the outcome of the trial. Not "every successful social science intervention in law should result in a legal victory."[219] In the Canadian context, where an expert witness is expressly required to act as an independent advisor to the court regardless of which party calls the witness,[220] this observation is even more apt. At the same time, Cole acknowledges "it is not entirely clear what would have constituted 'success' in the situation" in which one participates in a court case with the intention of bringing academic and scientific research to bear on the material issues.[221]

Although we have expressed disappointment in the reasons for verdict, positive changes have already ensued from *Bornyk*. As a result of Justice Funt's original judgment and the work done by all parties to prepare for retrial, the RCMP changed its policy regarding errors made by a fingerprint examiner to improve the institutional incentives to identify and correct those errors.[222] We trust that no RCMP forensic scientist will ever again testify that there are no errors in their field.

Based on the testimony given by Wilkinson at trial, we hope that examiners' bench notes will become more thorough. In particular, Wilkinson's testimony suggests that fingerprint examiners are now trained and required by policy to document the distinguishing features within a crime scene latent in writing before looking at a reference print.[223] However, the fingerprint examiners themselves suggested that they did not believe that this policy applies in every instance. Assuming that this policy is indeed in force, and being fully implemented, it has the potential to eliminate a key source of confirmation bias within ACE-V and to bring the RCMP further in line with a key recommendation from PCAST.[224] We are heartened to read that Wilkinson and co-authors are committed to improving proficiency testing for RCMP examiners and to conducting further research on statistical models for assigning weight to fingerprint evidence.[225]

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219 Simon A Cole, "A Cautionary Tale about Cautionary Tales About Intervention" (2009) 16:1 Organization 121 at 128 [Cole, *Cautionary Tale*].

220 *White Burgess*, *supra* note 3 at para 32.

221 Cole, *Cautionary Tale*, *supra* note 219 at 128.

222 *Bornyk* Retrial Transcript, *supra* note 20 at 70 (23 January 2017).

223 *Ibid* at 35 (25 January 2017).

224 PCAST Report, *supra* note 52 at 101–02.

225 *Ibid* at 324–25.

We also anticipate that, in future cases in which the Crown relies upon forensic science, bench notes will routinely be disclosed as part of the standard disclosure package.[226] Certainly, the Supreme Court of Canada's 2018 decision in *R v Gubbins* suggests that such disclosure should be made as a matter of course.[227] Bench notes constitute information "generated or acquired during or as a result of the specific investigation into the charges against the accused" and—as the *Bornyk* trial illustrates—they are obviously relevant to the reliability of a forensic examiner's opinion.[228]

In terms of the functions intended to be served by the adversarial trial itself, we regard the *Bornyk* example as less successful. Where Justice Funt was criticized by the Court of Appeal for British Columbia for descending into the fray, Justice Crawford seems to us to have been unduly reluctant to engage with the scientific research that was put into evidence before him. Indeed, at one point during the trial when defence counsel pressed the relevance of scientific literature regarding proficiency testing for fingerprint examiners, he expressed impatience:

> I don't have any difficulty in understanding the nature of the highly erudite and skilled papers that have been put forward in the last few years about the science of fingerprinting, and I am aware all too clearly, then, of—of the shortcomings in Sergeant Wolbeck's reporting of what he did, but that's what I've got.[229]

Justice Crawford advised counsel that he could not see how literature about proficiency testing was relevant to this case, in which "the reality of it is Wolbeck did his testing, he didn't make bench notes as he went through the initial examination, and he came to a conclusion. I realize we based it on his experience, as near as I can tell."[230] After a brief back and forth in which defence counsel pressed the significance of proficiency testing to assessing the reliability of Wolbeck's match decision, defence counsel took the hint and moved on.

Justice Crawford largely fails to explain his reasons for rejecting the defence theory of this case, which was of course fundamentally rooted in this scientific research. Cunliffe has argued that Canadian appeal courts are increasingly clear in their expectations that trial judges must actively engage with the reliability of expert testimony throughout the trial.[231] She has also suggested that trial judges appear to be finding it difficult to

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226 In *Bornyk,* bench notes were eventually disclosed as part of first party disclosure, however the Crown initially resisted making this disclosure.

227 *R v Gubbins*, 2018 SCC 44.

228 *Ibid* at para 22.

229 *Bornyk* Retrial Transcript, *supra* note 20 at 3 (27 January 2017).

230 *Ibid* at 4.

231 Cunliffe, *New Paradigm*, *supra* note 9.

discharge their new, more active role. These trends are evident in the cases of *Awer* and *Sekhon,* discussed in Part 4 B) of this article. However, they plainly operate in tension with the criminal legal system's historical and continuing resistance to judicial reliance on knowledge that originates outside the adversarial process.[232] In *Bornyk,* a slightly different problem appears to have arisen from those illustrated in previous case law: a trial judge, presented with extensive scientific research and testimony that challenged expert claims that were based on training and experience, deferred to the experience-based claims without explaining in his verdict why he considered the scientific research inapplicable.

A number of institutional features and particular legal rules make it difficult to bring evidence about the state of scientific research before Canadian courts. These features include the lack of funding for experts in legal aid cases and the paucity of forensic services available to criminal defendants. Most lawyers and judges are not scientifically trained or accustomed to reading, for example, statistical papers. Equally, it is difficult for an expert—however well versed they may be in a field—to recall nuanced details from an enormous literature in real time while testifying. Court time is scarce and expensive, and it is equally implausible to imagine calling the authors of every paper that may bear upon a material issue in order to ensure that the court interprets the scientific research correctly.

These structural factors are compounded by legal rules such as the rule in *R v Marquard*, which prevents counsel from cross-examining an expert witness on literature that she does not recognise as being authoritative.[233] Even where the witness recognises the literature, it must be read to the witness and adopted as part of her testimony. While this rule was established for good reasons—to prevent counsel from introducing prejudicial and potentially unreliable information through questioning—it has the potential to insulate an expert witness who, for example, persists with practices that have been criticized by reputable scientific agencies as empirically unfounded or unreliable. We would like to see this rule reconsidered.

In 2017, Cunliffe and Edmond published two articles that assessed the Canadian criminal legal system's response to wrongful convictions and the lessons that emerge from those wrongful convictions.[234] We argued that the criminal legal system has been slow to incorporate these

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232 Edmond, Hamer & Cunliffe, *A Little Ignorance*, *supra* note 42.

233 *R v Marquard*, [1993] 4 SCR 223, 108 DLR (4th) 47.

234 Emma Cunliffe & Gary Edmond, "Reviewing Wrongful Convictions in Canada" (2017) 64 3/4 Crim LQ 473 [Cunliffe & Edmond, *Reviewing Wrongful Convictions*]; Emma Cunliffe & Gary Edmond, "What Have We Learned? Lessons from Wrongful Convictions in Canada" in Benjamin Berger, Emma Cunliffe & James Stribopoulos, eds, *To Ensure that*

lessons, particularly as they relate to the reliability of expert evidence. Accordingly, we suggest that Canada needs a separate institution—a Justice & Science Commission—to commission and review research into legally relevant fields such as fingerprint examination, offer systemic reviews of the reliability of routine techniques and common claims, suggest systemic reforms, and monitor the implementation and effectiveness of those reforms.[235] Such a body would be independent of courts and law enforcement, but work closely with academic researchers, forensic scientists, lawyers and judges. Like PCAST and the NAS, it could work in dialogue with researchers and forensic practitioners to identify and evaluate evidence that bears upon the reliability of forensic science techniques, while holding a system-wide lens, and remaining independent of the adversarial pressures of courtrooms and the vested interests of forensic practitioners, law enforcement agencies and the legal profession. In her *Final Report* into the miscarriages of justice that arose from the Motherisk hair testing program, Justice Beaman concluded that the idea of a Justice & Science Commission and similar proposals "are examples of much-needed institutional responses to assist the justice system in making better use of scientific evidence."[236]

The potential value of such an institution, if carefully designed and operating to similarly rigorous standards and processes as the National Academy of Science and the President's Council of Advisors on Science and Technology is that it could:

> create an institutional space where scientists, lawyers, judges, and forensic leaders all work together; a collaborative space that values reason-giving, empirical research, and thoughtful engagement with evidence and its assessment[.][237]

Such a body could take the lead in improving the scientific literacy of forensic practitioners, lawyers and judges. We would add that such an institution could become a valuable source of system feedback—to judges, forensic practitioners and scientific researchers—about the quality of their work with forensic science. Such feedback is sorely lacking within the present case-by-case approach to assessing the reliability of expert evidence—as are the resources necessary to rigorously test state expert

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Justice is Done: Essays in Memory of Marc Rosenberg (Toronto: Thomson Reuters, 2017) at 129–47.

235 Cunliffe & Edmond, *Reviewing Wrongful Convictions*, *supra* note 234 at 484–85.

236 Judith Beaman, *Harmful Impacts: The Reliance on Hair Testing in Child Protection: The Report of the Motherisk Commission* (Toronto: Ministry of the Attorney General, February 2018).

237 Jennifer Mnookin, "The Uncertain Future of Forensic Science" (2018) 147:4 Daedalus 99 at 114.

claims within the adversarial context.[238] To us, the *Bornyk* conviction provides the latest in a growing list of examples that illustrate the need for such an institution. Certainly, if one measures success by reason giving, valuing empirical research, and thoughtful engagement with evidence and its assessment, the *Bornyk* retrial judgment falls short.

And what of the safety of the *Bornyk* conviction itself? Amidst the discussion of error rates and hypotheses, it may be easy to overlook that Mr Bornyk has been sentenced to prison on the strength of this retrial.[239] In this article, we have explained in some detail why we find Justice Crawford's reasons for verdict unsatisfying and why those reasons have given us pause about the possibility of burden-shifting.

We have no insight into whether the match determination would have been same if RCMP policy had been followed to the letter, the documentation had been adequate, and the examiners had been protected from biasing information. Nor can we say whether the crime scene latent is indeed sufficiently clear and extensive to permit a same source conclusion by examiners working in a laboratory that has adopted PCAST's recommendations. For what it's worth, we consider it to have been a lost opportunity to fail to fingerprint those who had innocent access to the object on which the crime scene latent was found, and we can also imagine a world in which the RCMP used its institutional relationships to ask the FBI or London's Metropolitan Police to re-analyse the prints using these agencies' current, more rigorous procedures. Had either or both of these steps been taken, this conviction would feel more secure.

Ultimately, we are left with our commitment to the proposition that the State bears the burden of proving the reliability of inculpatory evidence in the course of establishing identity beyond reasonable doubt, and with our disquiet about the extent to which Justice Crawford's verdict fails to engage with scientific research and expert testimony that bore directly on that task. We are also troubled by the fact that Crown and RCMP did not proactively draw the authoritative scientific reports discussed in this article to the court's attention, nor do they seem to have considered the implications of those reports for the match determination in this case until Funt J's error at the first trial and the defence strategy during the retrial demanded such engagement.

Our concerns are heightened by the fact that, after more than 100 years of fingerprint evidence being given in Canadian courts, *Bornyk* seems to have marked the first time that Canadian fingerprint examiners have ever

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238 See Cunliffe, *Charter Rights*, *supra* note 13.

239 *R v Bornyk*, 2017 BCSC 850.

been asked to provide a full account of the scientific evidence for their techniques and processes.[240] For an adversarial criminal system that is fundamentally committed to placing a demanding burden of proof upon the state, this is a remarkable failing. Against this background, when a test case predicated on a detailed evidentiary record receives such short shrift within a judge's reasoning, we are left to wonder how lawyers and judges can learn to grapple more effectively with the strength and weaknesses of forensic science evidence.

[240] Though, the *Bornyk* litigation may have stimulated additional challenges. See e.g. *R v Quinlan*, 2014 BCPC 374; *R v Huynh*, 2014 BCSC 665; *R v Gambilla*, 2015 ABQB 160; *R v Pakula*, 2017 ABPC 33; *R v Lewin*, 2019 BCCA 266. Unfortunately, these challenges were not always well supported or scientifically sophisticated.