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Gary Edmond

Emma Cunliffe
Allard School of Law at the University of British Columbia, cunliffe@allard.ubc.ca

Simon A. Cole

Andrew J. Roberts

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ADMISSIBILITY COMPARED: THE RECEPTION OF INCRIMINATING EXPERT EVIDENCE (I.E., FORENSIC SCIENCE) IN FOUR ADVERSARIAL JURISDICTIONS

Gary Edmond,[*] Simon Cole,[†] Emma Cunliffe,[‡] and Andrew Roberts[§]

INTRODUCTION

> The single most important observation about judicial [gate-keeping] of forensic science is that most judges under most circumstances admit most forensic science. There is almost no expert testimony so threadbare that it will not be admitted if it comes to a criminal proceeding under the banner of forensic science. . . . The applicable legal test offers little assurance. The maverick who is a field unto him- or herself has repeatedly been readily admitted under *Frye*, and the complete absence of foundational research has not prevented such admission in *Daubert* jurisdictions.[1]

There is an epistemic crisis in many areas of forensic science. This crisis emerged largely in response both to the mobilization of a range of academic commentators and critics and the rise and influence of DNA typing. It gained popular and authoritative support through the influence of the National Academy of Science (NAS) and a surprisingly critical report produced under its auspices by a committee of the National Research Council (NRC). Interestingly, as this article endeavors to explain, the courts themselves seem to have played a rather indirect, inconsistent and ultimately ineffective role in the supervision and evaluation of forensic science evidence. Indeed, in the

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[†] Associate Professor, School of Social Ecology, University of California, Irvine.

[‡] Associate Professor, School of Law, University of British Columbia.

[§] Senior Lecturer, School of Law, University of Melbourne.

[1] Jane Campbell Moriarty & Michael J. Saks, *Forensic Science: Grand Goals, Tragic Flaws, and Judicial Gatekeeping*, 44 JUDGES J. 16, 29 (2005).

aftermath of recent criticism of the forensic sciences, this essay considers the effect of the dominant admissibility standards that operate in four common law jurisdictions. The revealing result seems to be that although admissibility standards vary across these jurisdictions, actual admissibility practices are remarkably consistent. In this article we will question the extent to which courts (and legal personnel) are able to meaningfully invigilate the use of forensic science evidence in criminal proceedings and consider some of the ideological commitments and institutional pressures that might lead judges in all jurisdictions to prefer inclusive approaches to incriminating expert opinions.

In the first part of the article, we compare rules, jurisprudence and practices, across four jurisdictions: the United States, England and Wales, Canada, and Australia.[2] All profoundly shaped by the English common law, these jurisdictions (and their sub-jurisdictions) tend to use a mixture of common law (e.g. England and Wales and Canada), judge-made rules (e.g. the U.S. Federal Rules of Evidence) and statutory schemes (e.g. the Australian *Evidence Act 1995 Cth* and many states in the United States) to regulate the admission of evidence, including expert opinion.[3] These jurisdictions tend to maintain criminal trial processes that remain reasonably similar and facilitate broad brush comparisons.[4]

Forensic science and medical techniques are used routinely in criminal proceedings. We have selected techniques (and technologies) that are not necessarily standardized, but are regularly used in each of the four jurisdictions.[5] Legal recognition and treatment as distinctive types of evidence enables us to consider what these advanced jurisdictions, with different, though evolving, admissibility standards have done (and are doing) in response to the various techniques and opinions. Our findings suggest that admissibility standards, including the first generation of reliability-based standards, seem to make little, if any, difference to (traditional) admissibility decision-making and practice. Allowing for some variation, the same sorts of forensic science evidence are admitted across all jurisdictions, even where the techniques are not demonstrably reliable and the jurisdiction in question has explicit reliability standards and other rules regulating the admission of expert opinion evidence. Moreover, it is our contention that the legal accommodation of the techniques considered in this article exemplifies a more general response to admissibility and the regulation of forensic science and medicine evidence. In the second part of the article we will consider possible explanations and some of the implications of our findings.

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[2] Our study surveys and summarizes the leading decisions rather than a detailed empirical study of actual case practices across jurisdictions. Both would be interesting and informative, but this offers a first attempt to survey leading decisions against formal rules and overarching criminal justice objectives and values.

[3] *See generally* FED. R. EVID.; FED. R. EVID. 702 (Federal Rule of Evidence concerning expert testimony); *Australian Evidence Act 1995* (Cth) (a statutory scheme covering everything from cross examination to admission of evidence).

[4] It should be noted, however, that there are many differences, not all of which should be considered trivial. Canada, for example, has fewer trials before juries than the other jurisdictions. Many prosecutors and judges in the United States are elected, and the United States retains civil juries, making the admissibility of expert opinion evidence an important, and frequently controversial, issue in civil proceedings (e.g. tort and product liability litigation). There are no capital cases or capital juries in England, Canada, and Australia. Australia and England tend to provide *relatively* well-resourced defense lawyers and are more likely to expend state resources on defense experts than most U.S. states. Undoubtedly, these and a myriad of other differences in practice, traditions, and resourcing (of courts, police and forensic sciences, as well as parties) influence the ways in which forensic science and medicine evidence is developed, contested, and admitted.

[5] While there can be quite significant differences in actual practices, many of the techniques feature remarkably similar ingredients across our sample. Many of these similarities flow from information and technology sharing or the use of proprietary systems.

A. Rules of Evidence and Procedure

A fundamental condition of admissibility is that evidence must be relevant.[6] That means it must be capable of rationally influencing the assessment of *facts in issue* (i.e., the contested or material facts).[7] Ordinarily, opinion evidence is not admissible. Witnesses are normally required to testify about facts.[8] There are exceptions for some kinds of opinion evidence. Lay witnesses are frequently allowed to express opinions, especially those necessary to make sense of the witness' perceptions or impressions.[9] It is, for example, not uncommon for a witness to be allowed to express an opinion on events within their experience: such as a person's emotional state; whether someone was intoxicated; and even whether a car was being driven fast or dangerously.[10] Most of the forensic science evidence considered in this article is opinion evidence and subject to exclusionary rules operating in all of our jurisdictions. Because of its great potential to assist the *tribunal of fact*, all jurisdictions maintain an exception for the opinions of "experts" or for opinions based on "specialized knowledge."[11] Though not all require evidence about the reliability of the method or technique, or the expert's ability, for admissibility purposes. In most common law jurisdictions (with a jury), where the admissibility of expert opinion evidence is contested, the trial judge will conduct a hearing (a *voir dire* or *Daubert* hearing) into the admissibility of the evidence. Such hearings are normally held in the absence of the jury.

Once expert opinion evidence is deemed admissible, the expert witness is subject to direct (i.e., examination-in-chief) and limited re-direct (i.e., re-examination) by the party calling the witness and cross-examination by the other parties. It is not uncommon for an expert's report (or part thereof) to be tendered as his or her evidence-in-chief. In most adversarial jurisdictions the trial judge maintains a discretion to exclude otherwise admissible evidence if its reception would result in unfairness, or the value of the evidence is outweighed by any unfair prejudice it might engender.[12] In practice, where expert opinion evidence satisfies the exception to the opinion rule, trial and appellate judges rarely resort to discretionary powers to exclude incriminating evidence. In some jurisdictions (such as England), depending on the kind of evidence, the judge may offer some guidance or cautionary instructions to the tribunal of fact, in others (parts of Australia, under the uniform statutes, for example), there may be a duty to do so.[13] In recent years, in response to challenges and increasing sensitivity to reliability discourses, some judges have been prepared (or obliged), often in consultation with the lawyers, to prescribe the precise wording of parts of an expert's testimony. On some occasions, reading down the confidence or strength of opinions and conclusions operates as an admissibility compromise.

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[6] *See* JAMES BRADLEY THAYER, A PRELIMINARY TREATISE ON EVIDENCE AT THE COMMON LAW 485 (1898).

[7] *See id*. at 267; *see also* FED. R. EVID. 401 (establishing the Federal Rules of Evidence test for what evidence is relevant).

[8] In practice, courts in all jurisdictions acknowledge the blurred boundary between fact and opinion.

[9] *See* FED. R. EVID. 701.

[10] *See, e.g., id.* §§ 701 & 803(3).

[11] *See, e.g., id.* §§ 702-703; *Evidence Act 1995* (Cth) s 79 (Austl.); Criminal Code, R.S.C. 1985, c. C-46 (Can.); Criminal Procedure Rules, (2012), c. 33 §§ 1-2 (Eng.). We use 'tribunal of fact' interchangeably with 'trier of fact' and 'fact-finder.' A jury is the proto-typical tribunal of fact, but increasingly judges (and appellate courts) are involved in fact-finding. Joan Steinman, *Appellate Courts as First Responders: The Constitutionality and Propriety of Appellate Courts' Resolving Issues in the First Instance*, 87 NOTRE DAME L. REV. 1521, 1521, 1525 (2012) (discussing the role of appellate courts as fact-finders).

[12] *See, e.g.*, FED. R. EVID. 403; *Evidence Act 1995* (Cth) s 130 (Austl.) (codifying the common law *Christie* Discretion first established in *R. v. Christie* AC [1914] 545 (Austl.)); *Evidence Act 2008* (Cth) s 137 (Austl.).

[13] Civil Procedure Rules, (2012), c. 32 § 1 (Eng.); *Evidence Act 1995* (Cth) s 116 (Austl.).

Once expert opinion evidence is deemed admissible, the "weight" attached is a matter for the tribunal of fact based on what transpires at trial (e.g. cross-examination and rebuttal experts), along with any other evidence and instructions.

All of the jurisdictions considered in this article offer some kind of judicial review or appeal mechanism.[14] Trial and appellate courts appear to hold great confidence in the effectiveness of trial safeguards, and the abilities of tribunals of fact (whether judges or juries) and appellate courts to understand and evaluate incriminating expert opinion evidence.

B. The Epistemological Status of the Forensic Identification Sciences

Before moving to review admissibility rules, jurisprudence and practice in the U.S., England and Wales, Canada and Australia, it is helpful to provide a backdrop to the epistemic status of the forensic comparison techniques that form the primary focus of our study.

In what follows, we draw upon studies that have cast doubt on the adequacy of empirical support for the forensic science techniques that are routinely admitted in *all* of our jurisdictions. Our reason for doing so is that the results of these studies will tend to amplify the implications of our findings. In this respect, an important backdrop to our discussion and understanding of the value of the techniques is a recent report by the National Research Council of the United States National Academy of Science (NAS) published in 2009 (hereafter the NRC report).[15]

The NRC report is authoritative, particularly in relation to understanding the value of forensic science and medical evidence and the effectiveness of admissibility standards. The report is particularly illuminating of a range of "identification" sciences; because the multidisciplinary committee responsible for its drafting was surprisingly critical of the research base, or lack thereof, underpinning many techniques that are routinely relied upon in criminal investigations and prosecutions.[16] According to the NRC report:

> The degree of science in a forensic science method may have an important bearing on the reliability of forensic evidence in criminal cases. There are two very important questions that *should* underlie the law's admission of and reliance upon forensic evidence in criminal trials: (1) the extent to which a particular forensic discipline is founded on a reliable scientific methodology that gives it the capacity to accurately analyze evidence and report findings and (2) the extent to which practitioners in a particular forensic discipline rely on human interpretation that could be tainted by error, the threat of bias, or the absence of sound operational procedures and robust performance standards. These questions are significant: The goal of law enforcement actions is to identify those who have committed crimes and to prevent the criminal justice system from erroneously convicting the innocent. So it matters a great deal whether an expert is qualified to testify about

[14] England and Wales also have a free-standing Criminal Cases Review Commission. Peter Duff, *Straddling Two Worlds: Reflections of a Retired Criminal Cases Review Commissioner*, 72 MOD. L. REV. 693, 695-96 (2009); *See generally* LAURIE ELKS, RIGHTING MISCARRIAGES OF JUSTICE?: TEN YEARS OF THE CRIMINAL CASES REVIEW COMMISSION (2008).

[15] NAT'L RESEARCH COUNCIL, STRENGTHENING FORENSIC SCIENCE IN THE UNITED STATES: A PATH FORWARD (2009).

[16] Harry T. Edwards & Constantine Gatsonis, *Preface* to NAT'L RESEARCH COUNCIL, STRENGTHENING FORENSIC SCIENCE IN THE UNITED STATES: A PATH FORWARD, at xix-xx (2009).

> forensic evidence and whether the evidence is sufficiently reliable to merit a fact finder's reliance on the truth that it purports to support. . . . Unfortunately, these important questions do not always produce satisfactory answers in judicial decisions pertaining to the admissibility of forensic science evidence proffered in criminal trials.[17]

And, directly relevant to this article:

> With the exception of nuclear DNA analysis . . . no forensic method has been rigorously shown to have the capacity to consistently, and with a high degree of certainty, demonstrate a connection between evidence and a specific individual or source. . . . The law's greatest dilemma in its heavy reliance on forensic evidence, however, concerns the question of whether—and to what extent—there is science in any given forensic science discipline.[18]

While image evidence, and several other techniques and methods in widespread use were not included within the scope of its purview, many of the Committee's concerns appear readily applicable to these areas of practice.[19]

The NRC report is salient because the inability to support forensic science techniques and derivative opinion evidence with empirical evidence—and this applies to techniques that have been routinely admitted and relied upon for more than a century—seems to be a common feature of practice in all of our jurisdictions. In other words, the NRC report authoritatively exposes the lack of underlying research support for many forensic science and medical techniques in the United States *and elsewhere*.[20]

The NRC report recommends establishing a National Institute of Forensic Sciences to undertake research, standard setting and accreditation, in response to expressed doubts about the ability of lawyers and judges to credibly respond to what is characterized as the parlous state of affairs.[21]

> The report finds that the existing legal regime—including the rules governing the admissibility of forensic evidence, the applicable standards governing appellate review of trial court decisions, the limitations of the adversary process, and judges and lawyers who often lack the scientific expertise necessary to comprehend and evaluate forensic evidence—is inadequate to the task of curing the documented ills of the forensic science disciplines.[22]

It is also important to indicate that the authors have reservations about the value of many types of forensic science and several of those discussed in this article. In

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[17] NAT'L RESEARCH COUNCIL, *supra* note 15, at 9, 87.

[18] *Id.* at 7, 9.

[19] See STEPHEN GOUDGE, INQUIRY INTO PEDIATRIC FORENSIC PATHOLOGY IN ONTARIO 80 (2008) (discussing forensic pathology).

[20] Scholarly criticisms were frequently dismissed or ignored, but it is much more difficult to challenge the NRC report. See Gary Edmond & Kent Roach, *A Contextual Approach to the Admissibility of the State's Forensic Science and Medical Evidence*, 61 UNIV. TORONTO L.J. 343, 367-68 (2011). In Australia, forensic sciences are often defended on the basis of standards and accreditation, but the research underlying these standards is far from always obvious. Edmond is a member of the Standards Australia committee tasked with drafting standards for the forensic sciences in Australia. See also Gary Edmond, *What lawyers should know about the forensic 'sciences'*, 36 Adelaide L. Rev. (2014) (forthcoming).

[21] *See* NAT'L RESEARCH COUNCIL, *supra* note 15, at 19.

[22] *Id.* at 85.

particular, we are concerned that fingerprint, bite mark, image and voice comparison evidence is often relied upon or expressed in ways that are not consistent with existing empirical evidence.[23] Each of us has written about problems with expert evidence, and particularly forensic science and forensic medicine, and the manner in which admissibility standards and practice do not seem to prevent problematic forms of expert opinion evidence being adduced and admitted in criminal proceedings.[24] By way of summary, we share the general outlook expressed by the NRC. Our research and observations affirm that techniques routinely relied upon by investigators, prosecutors, jurors and judges are either unreliable or of unknown reliability.[25] This article represents an attempt to consolidate these experiences in a manner that facilitates a systematic comparison capable of illuminating the limits of current standards, practice and personnel when assessed against the overarching objectives of the accusatorial criminal trial.

The NRC report suggests that DNA evidence generally stands on a stronger scientific foundation than these other techniques;[26] though it should not be seen as infallible. There are continuing problems with DNA evidence that extend beyond chain of custody issues, to interpretations (especially of mixed samples and the random match probabilities for sub-populations), how to respond to increasingly sensitive analyses (such as those associated with low copy number techniques), the transportability of microscopic biological traces, and finally, whether the real-world risk of error (laboratory or otherwise) should be imposed on the fantastically large probabilities (and likelihood ratios) routinely

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[23] We are also engaged in debates about the expression of results in reports and testimony as well as the adequacy of the adversarial trial (and the effectiveness of its various processes and safeguards). *See* Gary Edmond, Kristy Martier & Mehere San Roque, *Unsound Law: Issues With ('Expert') Voice Comparison Evidence*, 35 MELB. U. L. REV. 52, 53-54 (2011) (contending that voice comparison evidence is readily admitted when the probative value is unknown and traditional features of the adversarial trial are inadequate to correct the associated problems).

[24] THE LAW COMM'N, EXPERT EVIDENCE IN CRIMINAL PROCEEDINGS IN ENGLAND AND WALES 14 (2011) (stating that an expert's opinion evidence must satisfy a threshold of acceptable reliability); SIMON A. COLE, SUSPECT IDENTITIES: A HISTORY OF FINGERPRINTING AND CRIMINAL IDENTIFICATION, 4-5 (2001) (reflecting on methods of criminal identification that have been suspect, such as fingerprint identification); Simon A. Cole, *More Than Zero: Accounting for Error in Latent Fingerprint Identification*, 95 J. CRIM. L. & CRIMINOLOGY 985, 988-91 (2005) (arguing that fingerprint identification is not error free); Simon A. Cole, *Is Fingerprint Identification Valid? Rhetorics of Reliability in Fingerprint Proponents' Discourse*, 28 L. & POL'Y 109, 109-10 (2006) (considering whether or not latent print identification is valid); EMMA CUNLIFFE, MURDER, MEDICINE AND MOTHERHOOD 2-4 (2011) (arguing that behavioral and scientific evidence cannot provide independent proof of guilt); Gary Edmond et al., *'Mere guesswork': Cross-Lingual Voice Comparisons and the Jury*, 33 SYDNEY L. REV. 395, 396 (2011) (outlining the dangers associated with the allowance of jurors to engage in voice identification and comparison); Gary Edmond at al., *Unsound Law: Issues With ('Expert') Voice Comparison Evidence*, 35 MELB. U. L. REV. 52, 53-54 (2011) (contending that voice comparison evidence is readily admitted when the probative value is unknown and traditional features of the adversarial trial are inadequate to correct the associated problems); Gary Edmond et al., *Law's Looking Glass: Expert Identification Evidence Derived from Photographic and Video Images*, 20 CURRENT ISSUES CRIM. JUST. 337, 337-38 (2009) (illustrating limitations with approaches to the use of images as evidence); Gary Edmond et al., *Atkins v. The Emperor: The 'Cautious' Use of Unreliable 'Expert' Evidence*, 14 INT'L J. EVIDENCE & PROOF 146, 146 (2010) (concerning jurisprudential weakness and problems with photo comparison and facial mapping evidence); Andrew Roberts, *Rejecting General Acceptance, Confounding the Gatekeeper: The Law Commission on Expert Evidence* CRIM. L. REV. 551 (2009).

[25] Professor Edmond is engaged in ongoing observational research. Professor Cole participates as an expert witness and advisor. Professor Cunliffe has undertaken empirical research into the relationship between expert testimony and scientific research. Professor Roberts is primarily a scholarly commentator. *See, e.g.*, Michael Lynch & Simon Cole, *Science and Technology Studies on Trial: Dilemmas of Expertise* 35 SOC. STUD. SCI. 269, 272-73 (2005). *See generally* Simon Cole, *A Cautionary Tale About Cautionary Tales About Intervention*, 16 ORG. 121 (2009).

[26] Although, there would appear to be more chance of accidental (though potentially incriminating) contamination with DNA than with most images and voice recordings, for example. *See* BRANDON L. GARRETT, CONVICTING THE INNOCENT: WHERE CRIMINAL PROSECUTIONS GO WRONG 100-02 (2011).

generated.[27] There are also problems with the manner in which DNA matches should be expressed that seem to raise profound challenges for a system of trials based on lay assessment of technical *and* other forms of evidence.[28] Moreover, it is unlikely that the possibility of full genetic sequencing will eliminate all of these risks, even if it changes what is meant by 'matching' DNA profiles.[29] Many of the original problems with DNA evidence are known (or "visible") today because of the existence and involvement of scientists (e.g. biologists, geneticists and statisticians) from beyond the institutionalized forensic sciences (and commercial providers). Nevertheless, the inclusion of DNA evidence, as a stabilized and research-based technology, enables us to compare practices associated with less stabilized or more controversial techniques, including some that are not supported by empirical evidence and openly questioned by the NRC and/or most attentive academic commentators.

Those allowed to give evidence, as some kind of expert, routinely use apparent or alleged similarities as the basis for opinions pertaining to the identification of a person of interest (POI). In some cases, as with photo-interpretation and bite marks, there is no established technique for explaining how traces—say images or bruising, respectively—relate to the objects that features in them or produced them. Even where the similarities or artifacts are *real* (or, as is more often the case, not contested) in most circumstances we have little idea of how common a particular feature is, or its relationship to (or independence from) other features. Notwithstanding such deficiencies, techniques based on comparisons are routinely used for the purposes of identification or to assist with identification at trial (and during pre-trial processes).[30] There is little, if any, evidence to support the value of opinions derived from these techniques, and furthermore, many of these forms of evidence are obtained in ways that are likely to create or exacerbate errors.

Taking just one example, it is very common for those using comparison techniques where the identity of an offender or source is at stake—and this even applies to latent fingerprint examiners and the interpretation of DNA profiles (especially in mixed samples)—to have access to information that is strictly irrelevant to their analysis but implicates a particular person, or persons, or source. Consequently, we have a range of individuals of varying levels of training and experience, offering opinions about evidence in conditions where there may be few, if any, empirically established methods or standards, and in circumstances where gratuitous information may influence the interpretation.[31] Moreover, attempts to ascertain proficiency or substantially mitigate many of the problems identified by scholarly commentators (and other critics) and the NRC report are highly variable. Rather, as this article illustrates, admissibility decisions are often relied upon by witnesses and investigative institutions to support techniques, and displace the need for scientific validation and proficiency testing.

One caveat. It may well turn out that some of the techniques and opinions we are discussing have considerable probative value. If evidence emerges that supports the

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[27] *Id.* at 101-02.

[28] *Aytugrul v. The Queen* [2012] HCA 15 (Unreported, 18 April 2012) (Austl.) (an example of a case in which the method of expressing DNA evidence was contested); *see also* Dawn McQuiston-Surrett & Michael J. Saks, *Communicating Opinion Evidence in the Forensic Identification Sciences: Accuracy and Impact*, 59 HASTINGS L.J. 1159, 1180 (2008) (citing research that indicates the method of expressing DNA match evidence can affect jurors).

[29] Ironically, this might be closer to what the latent fingerprint examiners had historically assumed.

[30] Problems with forensic science and medicine apply to pre-trial negotiations, especially plea-bargaining, where the limits of expert opinion evidence might not be recognized.

[31] *See* Itiel E. Dror et al., *Contextual Information Renders Experts Vulnerable to Making Erroneous Identifications*, 156 FORENSIC SCI. INT'L 74, 74 (2006). *See generally*, GARRETT, *supra* note 26.

accuracy of these techniques, that could hardly be seen as a vindication of past legal practice and a liberal approach, particularly in those jurisdictions with formal reliability standards. Moreover, future empirical *vindication* will not overcome the ways in which a range of biases and procedural problems, that may contaminate forensic science practice and conclusions, were and are routinely trivialized. Nor will it address persistent and unanswered questions about the ability of adversarial criminal proceedings and the various participants (i.e., lawyers, forensic scientists, judges and jurors) to credibly manage even highly reliable techniques. It is our contention that unreliable and speculative incriminating expert opinion evidence always threatens important institutional values such as rectitude of decision and the fairness of accusatorial proceedings.[32]

I. COMPARISON

Our comparative review begins with the U.S. because of its influence in the wake of the rise of DNA evidence and the institution of reliability standards and admissibility jurisprudence following the seminal *Daubert v. Merrell Dow Pharmaceuticals, Inc.* decision in 1993.[33]

A. The United States: Admissibility Standards, Jurisprudence, and Practice

The United States is a federal system encompassing 50 state courts as well as federal courts. In recent decades an expectation has emerged that judges will assume a "gate-keeping" role in controlling the admission of expert opinion evidence. Most, but not all, jurisdictions adhere to one of two principal approaches which are generally known by their leading cases: *Frye v. United States* (1923) and *Daubert v. Merrell Dow Pharmaceuticals* (1993).[34] Today, 29 states and the federal courts adhere to *Daubert* or a *Daubert*-like model.[35] *Daubert* has been described as a 'reliability-validity' model.[36] The principal attribute of *Daubert*, as opposed to *Frye*, is that it mandates that the trial court undertake an independent assessment of the evidence to determine its admissibility.[37] This aspect of *Daubert* has been often criticized, most conspicuously in Chief Justice Rehnquist's dissent, for its assumption that judges without scientific training are competent to evaluate scientific evidence.[38] Though commonly described as a four or five-part test, *Daubert* is really a two-part test derived from Rule 702 of the Federal Rules of Evidence (FRE).[39] The two criteria for admissibility under *Daubert* are relevance and

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[32] *See* Gary Edmond & Andrew Roberts, *Procedural Fairness, the Criminal Trial and Forensic Science and Medicine* 33 SYDNEY L. REV. 359 (2011).

[33] Daubert v. Merrell Dow Pharm., Inc., 509 U.S. 579 (1993).

[34] Frye v. United States, 293 F. 1013 (D.C. Cir. 1923); *Daubert*, 509 U.S. at 579.

[35] David E. Bernstein & Jeffrey D. Jackson, *The* Daubert *Trilogy in the States*, 44 JURIMETRICS J. 351, 355-56 (2004).

[36] DAVID H. KAYE ET AL., THE NEW WIGMORE: EXPERT EVIDENCE 288 n.22 (2d ed. 2010).

[37] *Daubert*, 509 U.S. at 585-93.

[38] *Id.* at 600-01.

[39] *Id.* at 588-89. Rule 702 of the Federal Rules of Evidence was designed to govern the admissibility of expert opinion evidence in United States Federal Courts (as an exception to the general prohibition on opinion evidence provided by the exclusionary Rule 701). The original version of Rule 702 read, "If scientific, technical, or other specialized knowledge will assist the trier of fact to understand the evidence or to determine a fact in issue, a witness qualified as an expert by knowledge, skill, experience, training, or education, may testify thereto in the form of an opinion or otherwise"; *See* FED. R. EVID. 702 (1975) (amended 2011).

reliability.[40] It was by way of explicating the idea of "reliability," that the Court articulated four (or five) criteria: (1) testing, (2) peer review and publication, (3) error rate and standards,[41] and (4) general acceptance in the relevant scientific community.[42] Not intended as a checklist, the criteria were to be applied flexibly to assist with admissibility decision-making.

Daubert was explicated in two further appeals to the Supreme Court, often described as its 'progeny': *General Electric v. Joiner* and *Kumho Tire v. Carmichael*.[43] Reiterating the importance of flexibility, in *Kumho* the Court explained that the *Daubert* criteria may be applied to admissibility determinations for non-scientific forms of expert evidence—i.e., "'technical' or 'other specialized' knowledge."[44] *Joiner*, importantly, states that the standard of review for admissibility decisions by trial courts is "abuse of discretion."[45] In consequence, admissibility decisions are not subject to stringent review and similar types of expert evidence may be treated disparately across jurisdictions, courtrooms and cases, as well as over time.

Rule 702 of the Federal Rules of Evidence, on which *Daubert* and *Kumho* were based, was revised in 2000 to make the need for 'reliability' explicit.[46] It now reads:

> A witness who is qualified as an expert by knowledge, skill, experience, training, or education, may testify thereto in the form of an opinion or otherwise if: (a) the expert's scientific, technical, or other specialized knowledge will help the trier of fact to understand the evidence or to determine a fact in issue; (b) the testimony is based on sufficient facts or data; (c) the testimony is the product of reliable principles and methods; and (d) the expert has reliably applied the principles and methods to the facts of the case.[47]

The revised version of Rule 702 seems to have made little discernible difference to practice and is largely conceived as a statutory explication of the *Daubert* and *Kumho* decisions.

Sixteen U.S. states, including some of the most populous, continue to adhere to the 'general acceptance' approach embodied in the earlier *Frye* decision.[48] *Frye* has been

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[40] *Daubert*, 509 U.S. at 594-95; *see* FED. R. EVID. 401, (stating that 'relevant evidence' means evidence having any tendency to make the existence of any fact that is of consequence to the determination of the action more probable or less probable than it would be without the evidence).

[41] It is these two items which are sometimes—quite logically since they have little obvious relation—disaggregated to purportedly render *Daubert* a five-, rather than a four-, part test. *See, e.g.*, Bond v. State, 925 N.E.2d 773, 779 (Ind. Ct. App. 2010).

[42] *Daubert*, 509 U.S. at 593-94. Sometimes the existence and use of standards is included as a fifth criterion. Perhaps the most notorious addition occurred when, on remand, Judge Kozinski added anxiety about 'science for litigation' into the mix. *See* Gary Edmond, *Supersizing* Daubert*: Science for Litigation and its Implications for Legal Practice and Scientific Research*, 52 VILL. L. REV. 857, 864-65 (2007).

[43] Kumho Tire v. Carmichael, 526 U.S. 137 (1999); General Electric v. Joiner, 522 U.S. 136 (1997). Some legal scholars find *Kumho* to be the most coherent of the three opinions (*Kumho, Joiner,* and *Daubert*) and argue that evidence scholars should speak of a '*Kumho* approach' to evidence, rather than a '*Daubert* approach.' *E.g.*, D. Michael Risinger, *Goodbye to All That, or A Fool's Errand, by One of the Fools: How I Stopped Worrying About Court Responses to Handwriting Identification (and "Forensic Science" in General) and Learned to Love Misinterpretations of* Kumho Tire v. Carmichael, 43 TULSA L. REV. 447, 462, 467 (2007).

[44] *Kumho*, 526 U.S. at 147-48.

[45] *Joiner*, 522 U.S. at 141.

[46] FED. R. EVID. 702(c) (2000) (amended 2012).

[47] *Id*. We use the terms 'trier of fact' and 'tribunal of fact' interchangeably.

[48] Alice B. Lustre, Annotation, *Post*-Daubert *Standards for Admissibility of Scientific and Other Expert Evidence in State Courts*, 90 A.L.R.5th 453 (2011).

called a 'deference' approach in that, rather than asking the trial judge to evaluate the reliability and validity of proffered evidence, *Frye* suggests that the judge try to ascertain how those scientists best positioned to undertake such an evaluation—'the relevant scientific community'—evaluate the evidence.[49]

Though deference and independent assessment of validity-reliability are quite different philosophically, in practice the two approaches have tended to produce remarkably similar outcomes. Indeed, empirical studies have observed little difference in outcomes between *Frye* and *Daubert* jurisdictions.[50] While the *Daubert* approach retains "general acceptance" as one of its "factors," this does not provide a very persuasive explanation for the apparent convergence.[51] Interestingly, studies suggest that U.S. judges struggle with several of the *Daubert* criteria, and are not in a position to make an assessment of the relevant community or the extent of acceptance.[52] Instead, they tend to use heuristics, such as credentials and experience, when making admissibility decisions in criminal trials and appeals.[53]

In addition, six U.S. states have been characterized as "hybrids" because their admissibility standards combine features from *Frye* and *Daubert*.[54] Three U.S. states have their own independent admissibility regimes.[55] Once again, these alternative admissibility standards have not produced practices or outcomes that diverge significantly from those associated with *Frye* and *Daubert*.

Among evidence scholars (and other observers), the U.S. courts' handling of forensic evidence in admissibility hearings and trials has been soundly and nearly universally excoriated.[56] This critical view was recently endorsed by the NRC Report, which characterized U.S. courts as "utterly ineffective" in using the law of expert evidence to encourage "forensic science professionals . . . to establish either the validity of [their] approach or the accuracy of [their] conclusions."[57]

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[49] *See* Paul C. Giannelli, *The Admissibility of Novel Scientific Evidence:* Frye v. United States, *a Half-Century Later*, 80 COLUM. L. REV. 1197, 1205 (1980). *Frye* was decided in 1923 but it was not widely used until much later.

[50] *E.g.*, Edward K. Cheng & Albert H. Yoon, *Does* Frye *or* Daubert *Matter? A Study of Scientific Admissibility Standards*, 91 VA. L. REV. 471, 511 (2005); Veronica B. Dahir et al., *Judicial Application of* Daubert *to Psychological Syndrome and Profile Evidence*, 11 PSYCHOL. PUB. POL'Y & L. 62, 62, 64, 78 (2005); Lloyd Dixon & Brian Gill, *Changes in the Standards for Admitting Expert Evidence in Federal Civil Cases Since the* Daubert *Decision*, 8 PSYCHOL. PUB. POL'Y & L. 251, 252, 285-86 (2002); Henry F. Fradella et al., *The Impact of* Daubert *on the Admissibility of Behavioral Science Testimony*, 30 PEPP. L. REV. 403, 443-44 (2003); Jennifer Groscup et al., *The Effects of* Daubert *on the Admissibility of Expert Testimony in State and Federal Criminal Cases*, 8 PSYCHOL. PUB. POL'Y & L. 339, 339 (2002).

[51] Cheng & Yoon, *supra* note 50, at 478.

[52] Groscup et al., *supra* note 50, at 341, 367.

[53] *Id.* at 357.

[54] Lustre, *supra* note 48.

[55] *Id.*

[56] *E.g.*, DAVID L. FAIGMAN ET AL., MODERN SCIENTIFIC EVIDENCE: FORENSICS (Student ed. 2008); KELLY M. PYREK, FORENSIC SCIENCE UNDER SIEGE: THE CHALLENGES OF FORENSIC LABORATORIES AND THE MEDICO-LEGAL DEATH INVESTIGATION SYSTEM (2007); Margaret A. Berger, *What Has a Decade of* Daubert *Wrought?*, 95 AM. J. PUB. HEALTH S59 (2005); Paul C. Giannelli, *The Supreme Court's "Criminal"* Daubert *Cases*, 33 SETON HALL L. REV. 1071 (2003); Jennifer L. Mnookin, *Fingerprints: Not a Gold Standard*, 20 ISSUES IN SCI. & TECH. 47 (2003); Risinger, *supra* note 43; Michael J. Saks & Jonathan J. Koehler, *The Coming Paradigm Shift in Forensic Identification Science*, 309 SCI. 892 (2005). *E.g.*, André Moenssens, *Fingerprint Identification: A Valid Reliable "Forensic Science"?*, 18 CRIM. JUST. 31 (2003); André Moenssens, *Palmprint and Handwriting I.D. Satisfy* Daubert *Rule*, THE CRIMINALIST (Spring 2004), *available at* http://njiai.org/Criminalist0604.pdf.

[57] NAT'L RESEARCH COUNCIL, *supra* note 15, at 53.

Other potential methods of controlling the reception of expert opinion in U.S. law include the probative value/prejudice discretion and jury instructions. Rule 403, embodying the federal version of the discretion, states that evidence may be excluded "if its probative value is substantially outweighed by a danger of . . . unfair prejudice, confusi[on of] the issues, [or] misleading the jury, [or by considerations of] undue delay, [waste of] time, or needless[presentation of] cumulative evidence."[58] Techniques deemed admissible under Rule 702 might, in theory, run afoul of Rule 403. Courts reluctant to tangle with complex reliability debates might go directly to Rule 403 to make a determination on the admissibility of evidence. Such reasoning appears most common in cases involving lie detection techniques, such as the polygraph. Some courts have evaded technical debate over the accuracy of the polygraph by finding that, whatever its accuracy, its potential for prejudice is greater.[59] Because many jurisdictions maintain an explicit reliability standard, once expert opinion evidence is deemed admissible, and therefore implicitly reliable, there is limited scope for subsequently finding that the evidence will create unfair prejudice.[60] Admissibility standards (such as Rule 702), in effect, almost always trump exclusionary discretions (such as rule 403).[61]

Courts might also seek to counter expert testimony that is exaggerated or of questionable validity through jury instructions, similar to those that have been delivered by some courts regarding the accuracy of eyewitness identification or extensions of the standard instructions for expert witnesses. Thus far, the use of jury instructions for forensic science in the U.S. has been quite limited, and much more limited than in the other jurisdictions considered in this article.[62]

Across the many U.S. jurisdictions, there is considerable variation in the selection and quality of judges, prosecutors and defenders, as well as the resources available to public defenders. It is often difficult to obtain public funding for a defense expert, especially in state-based prosecutions.[63] There is, in addition, tremendous variation in the provision and quality of forensic science and medicine evidence by the state. Some facilities employ personnel with academic-level scientific credentials and state of the art equipment and facilities. Others are tiny, poorly equipped laboratories operated by a handful of employees with modest scientific credentials, at best. Some forensic disciplines are situated within police departments, rather than crime laboratories. Some states still rely on coroners, rather than medical examiners. Virtually all U.S. public forensic science providers suffer from serious resource constraints.

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[58] FED. R. EVID. 403.

[59] DAVID L. FAIGMAN ET AL., SCIENCE IN THE LAW: STANDARDS, STATISTICS AND RESEARCH ISSUES 60 (2002).

[60] *See, e.g.*, Daubert v. Merrell Dow Pharm., Inc., 509 U.S. 579, 595 (1993); United States v. Dorsey, 45 F.3d 809, 815-16 (4th Cir. 1995). The example of the lie detector probably encapsulates older attempts to manage polygraphs that pre-date the Federal Rules of Evidence and *Daubert*. We might expect that rule 702, *Daubert*, and rule 403 will be applied to manage new techniques of lie detection associated with scanning technologies such as fMRI. Although, several appellate courts have suggests that rule 403 might have more purchase in relation to expert evidence than other kinds of evidence.

[61] *Daubert*, 509 U.S. at 595.

[62] United States v. Starzecpyzel, 880 F. Supp. 1027 (S.D.N.Y. 1995). Perhaps the best known instruction was delivered by the court which analyzed forensic document examination to harbor piloting. State v. Quintana, 103 P.3d 168 (Ct. App. Utah 2004) (Thorne, J., concurring); United States v. Zajac, 2010 WL 4363637 (D. Utah 2010). Disclosure: One of the authors was a consultant to the defendant in this case. Jury instructions have been proposed by attorneys, but not delivered by judges, in cases involving latent prints, and perhaps other areas as well.

[63] Ake v. Oklahoma, 470 U.S. 68, 83 (1985); *see* Paul C. Giannelli, *The Right to Expert Assistance in a Post-Daubert, Post-DNA World*, 89 CORNELL L. REV. 1305 (2004).

1. Latent Fingerprint Evidence

Latent print evidence was first deemed admissible in the United States in *People v. Jennings* in 1911.[64] In that case, the primary defense argument was oriented toward treating the evidence as "ostensive" evidence—that is, evidence that did not require expert interpretation—rather than exclusion.[65] In finding the testimony of the latent print expert admissible, the decision relied primarily on two propositions which formed the backbone of many subsequent decisions: first, the fact that numerous authorities stated that latent print evidence was reliable; and, second, the reasoning that the reliability of latent print evidence may be inferred from the supposed "uniqueness" of the human friction ridge skin that produces the impressions we call "fingerprints."[66] For good reason, the second proposition has been characterized as the "fingerprint examiner's fallacy."[67]

Subsequent cases generally followed this pattern, culminating perhaps in *Grice v. State*, where the Texas Court of Criminal Appeals suggested "that instead of the state being called upon . . . to offer proof that no two finger prints are alike, it may now be considered in order for those taking the opposite view to assume the burden of proving their position."[68] With this ruling the admissibility of latent print evidence no longer seemed susceptible to challenge until the *Daubert* decision in 1993.

Beginning with *United States v. Mitchell*, there have been numerous admissibility challenges to latent print evidence in the U.S in the aftermath of *Daubert.*[69] Many of these cases have generated reported decisions. In almost all cases, latent print evidence was deemed admissible.[70] Page *et al.* found that 93 per cent of admissibility challenges to

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[64] 96 N.E. 1077, 1083 (Ill. 1911).

[65] *Id.* at 1082. This approach has been adopted by some courts in India. Jennifer L. Mnookin, Images of Truth: Evidence, Expertise, and Technologies of Knowledge in the American Courtroom (1999) (unpublished Ph.D. thesis, Massachusetts Institute of Technology) (on file with author).

[66] *Id.* at 1082.

[67] Simon A. Cole, *Grandfathering Evidence: Fingerprint Admissibility Ruling from Jennings to Llera Plaza and Back Again*, 41 AM. CRIM. L. REV. 1189, 1197 (2004); *see* Simon A. Cole, *Forensics Without Uniqueness, Conclusions Without Individualization: The New Epistemology of Forensic Identification*, 8 L. PROBABILITY & RISK 233, 233-255 (2009).

[68] Grice v. State, 151 S.W.2d 211, 221 (Tex. Crim. App. 1941).

[69] United States v. Mitchell, 365 F.3d 215 (3d Cir. 2004). Although *Mitchell* was the earliest post-*Daubert* admissibility challenge to latent print evidence, heard in 1999, the trial court did not issue a written ruling (after a five-day admissibility hearing), and the appellate decision was not issued until 2004. By that time, cases whose admissibility hearings (or refusals to hold admissibility hearings) has been held later, such as *Havvard*, had already become law, including at least one case, *Llera Plaza*, which had relied upon the admissibility hearing record generated by *Mitchell*. When it finally appeared, however, the 2004 opinion by a respected justice on the Third Circuit of Appeals was quite comprehensive. The decision is perhaps most notable for its very weak interpretation of *Daubert*, in which evidence that relies on 'testable' propositions is deemed admissible, even if, even after nearly a century of courtroom use, those propositions have never been formally 'tested', but only subjected to what the court termed—apparently without irony—'implicit testing.' *See* Simon A. Cole, *'Implicit Testing': Can Casework Validate Forensic Techniques?*, 46 JURIMETRICS J. 117 (2006).

[70] Mara L. Merlino et al., *Meeting the Challenges of the* Daubert *Trilogy: Refining and Redefining the Reliability of Forensic Evidence*, 43 TULSA L. REV. 417 (2007). One group of commentators developed a useful taxonomy summarizing the reasoning used by the federal courts to continue to admit latent fingerprint evidence in this substantial body of cases. For them, the taxonomy amounts to "little more than a catalog of evasions." FAIGMAN ET AL., *supra* note 56, at 187. Reasons include: refusing to hold an admissibility hearing (*e.g.*, United States v. Reaux, 2001 U.S. Dist. LEXIS 11883 (E.D. La. 2001)); reversing of the burden of persuasion (*e.g.*, United States v. Rogers, 26 Fed. App'x 171 (4th Cir. 2001)); misinterpreting *Daubert* and *Kumho* (*e.g.*, United States v. Havvard, 117 F. Supp. 2d 848 (S.D. Ind. 2000); United States v. Havvard, 260 F.3d 597 (7th Cir. 2001)); deferring to the pro-admissibility decisions produced by other courts (*e.g.*, *Havvard*); emphasizing the 'flexibility' language in *Daubert* (*e.g.*, *Rogers*); "bringing the standards down to meet the expertise" (*e.g.*, United States v. Cline, 188 F. Supp. 2d 1287 (D. Kan. 2002)); and relegating the issues to weight rather than admissibility (*e.g.*, *Cline*). Faigman and his colleagues found the reasoning in state cases much the same, regardless of whether the jurisdiction adhered to *Frye* or *Daubert*. "Whatever route is taken," they note dryly,

latent print evidence resulted in unrestricted admission, and that figure is probably conservative given that many of the cases coded as "exclusions" were either only partial exclusions, concerned case specific issues peripheral to reliability, or were reversed on appeal.[71]

The leading case in the post-*Daubert* era is *United States v. Havvard*.[72] The trial court described latent print evidence as "the very archetype of reliable expert testimony."[73] Undoubtedly, the most notorious appeal was *United States v. Llera Plaza*.[74] It represented the first time in nearly a century that latent print evidence was substantially restricted or impugned in any way.[75] Based on the stipulated admissibility hearing record from *Mitchell*, the court found latent print evidence wanting when judged against the *Daubert* "factors,' with the exception of 'general acceptance."[76] The court did not, however, exclude the latent print evidence, preferring to opt for what has subsequently been labeled "split testimony."[77] That is, the examiners were permitted to describe similarities between the two prints but prevented from expressing an opinion about the significance of those findings of similarity.[78] Following a motion for reconsideration and a live hearing, the court reversed itself.[79] Perhaps the most significant move was shifting the burden of persuasion to the defendant and requiring him to show that latent print evidence is *un*reliable.[80]

U.S. courts almost always rule that latent print evidence satisfies whatever admissibility threshold is in place.[81] The few exceptions to this overall trend are: *Virgin Islands v. Jacobs*, in which the government put on no case whatsoever in response to the defendant's motion to exclude the evidence; *Commonwealth v. Patterson*, in which

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"the destination is admission." FAIGMAN ET AL., *supra* note 56, at 212; Simon A. Cole, *Out of the* Daubert *Fire and into the Fryeing Pan? The Admissibility of Latent Print Evidence in* Frye *Jurisdictions*, 9 MINN. J. L. SCI. & TECH. 453 (2008). It is possible, however, that *Frye* jurisdictions, somewhat counter intuitively, offer a more hospitable forum for admissibility challenges to latent print evidence than do *Daubert* jurisdictions. The *State v. Rose* decision provides some anecdotal support for this notion, but it is, of course, difficult to conclude much from a single case.

[71] Mark Page et al., *Forensic Identification Science Evidence Since Daubert: Part I—A Quantitative Analysis of the Exclusion of Forensic Identification Science Evidence*, 56 J. FORENSIC SCI. 1180 (2011).

[72] United States v. Havvard, 260 F.3d 597 (7th Cir. 2001).

[73] United States v. Havvard, 117 F. Supp. 2d 848, 855 (S.D. Ind. 2000).

[74] United States v. Llera Plaza, 179 F. Supp. 2d 492 (E.D. Pa. 2002) *vacated*, 188 F. Supp. 2d 549 (E.D. Pa. 2002).

[75] *Id.* at 494. A second reason for its prominence was probably the eminence of the trial judge.

[76] *Id.* at 515.

[77] Laura Tierney, *Forensic Science Disciplines and* Daubert*: A Trend Toward "Split Testimony,"* Impression & Pattern Evidence Symposium (2010).

[78] *Id.*

[79] United States v. Llera Plaza, 188 F. Supp. 2d 549, 570 (E.D. Pa. 2002).

[80] *But see, e.g.*, FAIGMAN ET AL., *supra* note 56; Cole, *supra* note 67, *passim*; David H. Kaye, *The Nonscience of Fingerprinting:* United States v. Llera Plaza, 21 QLR 1073 (2003); Tara Marie La Morte, *Sleeping Gatekeepers:* United States v. Llera Plaza *and the Unreliability of Forensic Fingerprinting Evidence under* Daubert, 14 ALB. L.J. SCI. & TECH. 171 (2003). Among the most perplexing aspects of the opinion was the way in which the discovery, in the live hearing, that the U.S. Federal Bureau of Investigation imposed extremely *easy* proficiency tests on its examiners somehow increased the court's confidence in the reliability of latent print identification. Another curious aspect of the opinion, quite relevant to the cross-national focus of this article, was the court's reliance on events in the U.K.—specifically its recent abandonment of its historic '16-point standard' for declaring a latent print 'identification' in favor of the North American practice of having no standard at all—as somehow vouching for the reliability of latent print evidence in the U.S., based on the logically and historically dubious reasoning that the British had 'invented' latent print identification. *See* Cole, *supra* note 67.

[81] Cole, *supra* note 70, at 516; Jennifer L. Mnookin, *The Validity of Latent Fingerprint Identification: Confessions of a Fingerprinting Moderate*, 7 L. PROBABILITY & RISK 127 (2008).

Supreme Judicial Court of Massachusetts deemed latent print evidence in general admissible, but excluded evidence based on "simultaneous" or "cluster" impressions; and, *United States v. Llera Plaza I* (discussed previously).[82] In addition, Judge Michael of the Fourth Circuit Court of Appeals issued a strong dissent to the upholding of the trial court's admission of latent print and handwriting evidence in *United States v. Crisp*.[83] Another glimmer of dissent may be found in a concurring opinion in *State v. Quintana*, where Judge Thorne, though agreeing that latent print evidence should be admissible, argued that the defendant should be entitled to a jury instruction on the fallibility and limitations of latent print evidence.[84]

The most significant exception, however, was *State v. Rose*, in which a Maryland trial judge excluded latent print evidence in a capital murder trial.[85] The government's motion for reconsideration was unsuccessful, and, because Maryland does not allow interlocutory appeals, this decision effectively ended the case.[86] Interestingly, the case was re-filed in federal court, shifting the case from a *Frye* to a *Daubert* jurisdiction, where the evidence was subsequently deemed admissible.[87] *Rose* is one of a handful of admissibility decisions written after the publication of the landmark NRC report.[88] These decisions are significant because it seems plausible that the NRC Committee's findings might have altered the courts' overwhelming tendency toward admission. Specifically, the Report concluded that "ACE-V," the "methodology"[89] that U.S. latent print examiners purport to use, is not validated, and that "individualization," the only inculpatory testimonial conclusion that U.S. latent print examiners are permitted to offer, is not empirically sustainable.[90] The Committee's ability to find only "limited" information on the accuracy and reliability of latent print identification would seem to have some bearing on the admissibility of the evidence.[91] Although the Report never explicitly takes a position on the aforementioned cases, its discussion of cases admitting latent print evidence assumes a critical tone.[92]

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[82] John P. Black, *Pilot Study: The Application of ACE-V. to Simultaneous (Cluster) Impressions*, 56 J. FORENSIC IDENTIFICATION 933 (2006) (discussing a description of 'simultaneous' impressions)

[83] United States v. Crisp, 324 F.3d. 261, 272 (4th Cir. 2003).

[84] State v. Quintana, 2004 UT App 103 P.3d 168, 170 (Thorne, J., concurring).

[85] State v. Rose, No. K06-0545 (Cir. Ct. Baltimore Cty. Md. 2008).

[86] *Id.*

[87] United States v. Rose, 672 F. Supp. 2d 723, 726 (D. Md. 2009).

[88] NAT'L RESEARCH COUNCIL, *supra* note 15.

[89] Sandy L. Zabell, *Fingerprint Evidence*, 13 J.L. & POL'Y 143, 178 (2005). It is almost certainly not correct to call ACE-V. a methodology. Courts generally do so, however, and the dispute is probably of minor importance. *Id*. at 177-78.

[90] NAT'L RESEARCH COUNCIL, *supra* note 15.

[91] *Id.* at 142. See also Expert Working Group on Human Factors in Latent Print Analysis, *Latent Print Examination and Human Factors: Improving the Practice through a Systems Approach* (U.S. Department of Commerce, National Institute of Standards and Technology, 2012). Commissioned by the National Institute of Science and Technology (NIST) and the National Institute of Justice (NIJ) and focused exclusively on latent fingerprints, this multi-authored, multidisciplinary report endorses and develops the concerns expressed in by the NRC committee.

[92] *Id.* at 103-05. It calls evidence scholars' critiques of *Crisp* 'telling' and notes that the Crisp Court's assertion of the 'reliability' of latent print evidence rested solely upon legal precedents but "pointed to no studies supporting the reliability of fingerprint evidence." The Report accuses the *Havvard* Court of 'overstat[ing]' the expert's testimony and "giv[ing] fuel to the misconception that the forensic discipline of fingerprinting is infallible." The Report is conspicuously not commensurately critical of the *State v. Rose* decision excluding latent print evidence, which the Report commends for going "into considerable detail."

Nevertheless, the NRC Report has not exerted the effect that one might have anticipated.[93] There have been no cases excluding latent print evidence since its release. Anecdotally, where the evidence is challenged, courts appear to be eschewing blanket admission or exclusion in favor of the "split testimony" approach.[94] Some courts have precluded very strong conclusions couched in words like "individualized", "identification to the exclusion of all others", and "absolute" by restricting witnesses to describing similarities between two prints but not offering an opinion as to the meaning of those findings. Given the position adopted in the NRC Report, split testimony is likely to remain an attractive option for trial courts.

2. DNA Evidence

During the earliest years in which DNA evidence was introduced, its admissibility was extensively litigated in the U.S. in a series of contests, sometimes labeled as the "DNA wars."[95] In the earliest cases, DNA evidence was either not challenged or not challenged competently, and it was routinely admitted.[96] In later cases, defense attorneys enlisted well-credentialed molecular biologists who were able to gradually expose sloppy practices, failure to adhere to protocols, and unprincipled (and biased) interpretations of data.[97] These interventions and criticisms produced a number of cases in which state courts excluded DNA results, perhaps most famously in *People v. Castro.*[98] Not insignificantly, these exclusions were quickly followed by federal courts deeming similar evidence admissible; in *United States v. Jakobetz* and *United States v. Yee*.[99]

Successful challenges to the admissibility of DNA evidence drew on population genetics to challenge the calculation of the "random match probability" (RMP) which is generally a vital component in the interpretation of DNA evidence. Drawing on debates among geneticists about human mating patterns, defendants argued that the state's RMP calculations were not accepted in the scientific community. These cases helped to trigger the intervention of the National Academy of Sciences—through its National Research Council committees. The NRC issued two reports, in 1992 and 1996, each of which endorsed two different ways of estimating the RMP, the "ceiling principle" and the "product rule" respectively.[100] Following the first report, some courts excluded RMPs

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[93] *See* Harry Edwards, *Solving the Problems That Plague the Forensic Science Community*, 50 JURIMETRICS J. 5 (2010).

[94] Tierney, *supra* note 77. Simon A. Cole, *Splitting Hairs? Evaluating 'Split Testimony' as an Approach to the Problem of Forensic Expert Evidence,* 34 SYDNEY L. REV. 459 (2011) (discussing 'split testimony').

[95] *See* JAY D. ARONSON, GENETIC WITNESS: SCIENCE, LAW, AND CONTROVERSY IN THE MAKING OF DNA PROFILING (2007); DAVID H. KAYE, THE DOUBLE HELIX AND THE LAW OF EVIDENCE (2010). *See also* MICHAEL LYNCH ET AL., TRUTH MACHINE: THE CONTENTIOUS HISTORY OF DNA FINGERPRINTING (2008); Sheila Jasanoff, *The Eye of Everyman: Witnessing DNA in the Simpson Trial,* 28 SOC. STUDIES OF SCI. 713 (1998); Eric Lander, *DNA Fingerprinting: Science, Law, and the Ultimate Identifier, in* THE CODE OF CODES: SCIENTIFIC AND SOCIAL ISSUES IN THE HUMAN GENOME PROJECT 191 (Daniel J. Kevles & Leroy Hood eds., 1992); Michael Lynch, *The Discursive Production of Uncertainty: The OJ Simpson 'Dream Team' and the Sociology of Knowledge Machine,* 28 SOC. STUDIES OF SCI. 829 (1998); Jennifer L. Mnookin, *People v. Castro: Challenging the Forensic Use of DNA Evidence, in* EVIDENCE STORIES 207 (Richard Lempert ed., 2006); William C. Thompson, *Evaluating the Admissibility of New Genetic Identification Tests: Lessons from the 'DNA War',* 84 J. CRIM. L. & CRIMINOLOGY 22 (1993).

[96] ARONSON, *supra* note 95, at 41; KAYE, *supra* note 95, at 65.

[97] ARONSON, *supra* note 95, at 42.

[98] 545 N.Y.S.2d 985, 980 (N.Y. Sup. Ct. 1989). *See also* State v. Schwartz, 447 N.W.2d 422, 428 (Minn. 1989); ARONSON, *supra* note 95, at 57; KAYE, *supra* note 95, at 74; Thompson, *supra* note 95, at 42-43.

[99] ARONSON, *supra* note 95, at 118, 120; KAYE, *supra* note 95, at 75, 94.

[100] ARONSON, *supra* note 95, at 153; KAYE, *supra* note 95, at 98.

proffered by the government: *Commonwealth v. Lanigan*, *State v. Bible*, *State v. Cauthron*, and *State v. Anderson*.[101] The second report, however, practically eliminated admissibility challenges based on population genetics. to the extent that the government asserted that it was adhering to the NRC recommendation, admissibility challenges were unlikely to succeed, and subsequent cases upheld admissibility.[102] Since the mid-1990's DNA evidence in general has been universally admissible.[103]

Targeted admissibility challenges are still made. In *People v. Venegas*, the California Supreme Court reversed a conviction because of an improper "binning" procedure in calculating the RMP.[104] Another avenue of challenge concerns how a "cold" database search affects the calculation of the RMP. Since statisticians disagreed about how the fact that a DNA association was generated through a database search should be handled (though all agreed that it mattered), defendants argued that the government's method of calculating the RMP was not "generally accepted."[105] DNA evidence was excluded on this basis in *United States v. Jenkins*,[106] though, this ruling was overruled by the D.C. Court of Appeals in an interlocutory appeal.[107] The appeals court reasoned that the disagreement over which statistic was appropriate to present to the jury fell into the "legal" rather than the "scientific" domain and thus a decision that could be made by the trial court without deferring to the "relevant scientific community."[108] The California Supreme Court, on the other hand, denied a similar appeal by simply rejecting what to statisticians would be an indisputable point—that the manner in which the search is conducted affects the probability that one can assign to the result of that search.[109] The Court concluded that the fact that database search was conducted "simply does not matter."[110] Two years later, however, the California Supreme Court reached the same result but switched its rationale to one more like that employed in *Jenkins*.[111]

There has been some litigation about the conclusions that DNA analysts should be permitted to state in their testimony and that prosecutors should be permitted to state in their summations. In several cases, defendants challenged the use of likelihood ratios to present the probative value of DNA mixtures. These challenges were all unsuccessful.[112] In *Commonwealth v. Girouard*, the defendant sought to exclude what he characterized as

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[101] KAYE, *supra* note 95, at 107.

[102] *Id.* at 158.

[103] ARONSON, *supra* note 95, at 173; DAVID L. FAIGMAN ET AL., MODERN SCIENTIFIC EVIDENCE: FORENSICS 62 (Student ed. 2008); NATIONAL RESEARCH COUNCIL, STRENGTHENING FORENSIC SCIENCE IN THE UNITED STATES: A PATH FORWARD 99 (2009). Perhaps the most famous motion to exclude DNA evidence was one that was never filed. Although the defendant's "Dream Team" prepared an extensive motion to exclude DNA evidence in *People v. O.J. Simpson*, sometimes called the "Trial of the Century," they withdrew the motion early in 1995. Instead, the defense team famously—and generally, it would appear, successfully—opted to attack the weight of the evidence at trial by showing sloppy procedures, inadvertent contamination, and possible planting of evidence. *See* ARONSON, *supra* note 95, at 173; KAYE, *supra* note 95, at 152-53; Michael Lynch, *The Discursive Production of Uncertainty: The OJ Simpson 'Dream Team' and the Sociology of Knowledge Machine*, 28 SOC. STUDIES OF SCI. 829, 830 (1998); William C. Thompson, *Proving the Case: The Science of DNA: DNA Evidence in the O.J. Simpson Trial*, 67 U. COLO. L. REV. 827, 831-40 (1996).

[104] People v. Venegas, 954 P.2d 525, 553-55 (Cal. 1998).

[105] *Id.* at 549.

[106] United States v. Jenkins, 887 A.2d 1013, 1015-16 (D.C. Cir. 2005).

[107] *Id.* at 1016.

[108] *Id.* at 1025-26.

[109] People v. Johnson, 43 Cal. Rptr. 3d 587, 590 (Cal. Ct. App. 2006).

[110] *Id.* at 598.

[111] People v. Nelson, 185 P.3d 49, 66 (Cal. 2008).

[112] FAIGMAN ET AL., *supra* note 103, at 90.

an overstated conclusion by the state's DNA expert: that "no one other than [the defendant] is the donor of the DNA."[113] The trial court admitted the testimony, and the Supreme Judicial Court of Massachusetts upheld this decision, reasoning that any problems with such testimony could be rectified through cross-examination or rebuttal expert testimony.[114] In *McDaniel v. Brown*, the Supreme Court accepted that the state's witness had made erroneous calculations and committed the "prosecutor's fallacy."[115] The court adverted to the impropriety of the prosecutor's fallacy, but concluded that the defendant had legally forfeited the claim.[116]

There has thus far been only a small amount of litigation over DNA profiling techniques more exotic than the STR testing that has become standard. An admissibility challenge to Y-STR haplotyping failed in *Curtis v. State*, and this result was upheld by the appellate court.[117] Similarly, a trial court admitted mitochondrial DNA profiling in *State v. Pappas*, and this result was upheld by the Supreme Court of Connecticut.[118] The Court found the procedures for mitochondrial DNA testing to be "generally accepted in the scientific community" and "that the trial court did not abuse its discretion in ruling that the statistical methods used to derive that mtDNA type frequency in this case were scientifically valid," even though a defense expert demonstrated that the particular calculations advanced by the government's expert were flawed.[119] In marked contrast to England, Wales and Australia (more below), there have been no published U.S. cases concerning low copy number (LCN) DNA profiling, though the use of LCN has been litigated.[120] Notably, some of the principal defenders of the use of DNA profiling during the "DNA wars," such as Bruce Budowle, formerly of the FBI, have emerged as critics of LCN.[121]

3. Bite marks

Bite mark evidence has almost always been found admissible by U.S. courts.[122] The earliest reported case seems to be *Doyle v. State* from 1954.[123] Typically, for the time,

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[113] Commonwealth v. Girouard, 766 N.E.2d 873, 882 (Mass. 2002).

[114] *Id.* at 882.

[115] McDaniel v. Brown, 558 U.S. 120, 120 (2010); KAYE, *supra* note 95, at 173. Erin Murphy & William C. Thompson, *Common Errors and Fallacies in Forensic DNA Statistics: An Amicus Brief in McDaniel v. Brown*, 46 CRIM. L. BULL. 709 (2010); William C. Thompson & Edward L. Schumann, *Interpretation of Statistical Evidence in Criminal Trials*, 11 L. & HUM. BEHAV. 167 (1987) (explaining fallacies in the interpretation of statistical evidence to which lay people are susceptible).

[116] *McDaniel*, 558 U.S. at 120.

[117] KAYE, *supra* note 95, at 211.

[118] *Id.* at 232; State v. Pappas, 776 A.2d 1091, 1095 (Conn. 2001).

[119] *Pappas*, 776 A.2d at 1104-05, 1111; KAYE, *supra* note 95, at 236.

[120] *United States v. Davis*, 602 F. Supp. 2d 658 (D. Md. 2009).

[121] Bruce Budowle et al., *Validity of Low Copy Number Typing and Applications to Forensic Science*, 50 CROAT. MED. J. 207 (2009), *available at* http://www.ncbi.nlm.nih.gov/pmc/articles/PMC2702736/.

[122] Marjorie A. Shields, *Admissibility and Sufficiency of Bite Mark Evidence as Basis for Identification of Accused*, 1 A.L.R. 6th 657, 657 (2005); Erica Beecher-Monas, *Reality Bites: The Illusion of Science in Bite-Mark Evidence*, 30 CARDOZO L. REV. 1369, 1369 (2009); FAIGMAN ET AL., *supra* note 103, at 446. Page et al. found that it was admitted without restriction in 83 percent of cases in which it was challenged. Mark Page et al., *Forensic Identification Science Evidence Since Daubert: Part I—A Quantitative Analysis of the Exclusion of Forensic Identification Science Evidence*, 56 J. FORENSIC SCI. 1180, 1183 (2011). This figure is probably an underestimate because several cases, such as *Ege v. Yukins* discussed below, were coded as 'exclusions' notwithstanding their case-specific holdings.

[123] Doyle v. State, 263 S.W.2d 779, 779 (Tex. Crim. App 1954); FAIGMAN ET AL., *supra* note 103, at 447.

the defendant raised only procedural objections that did not extend to the empirical foundations of the technique.[124] The leading case is *People v. Marx*, in which a California appellate court upheld the admission of bite mark evidence.[125] It is important to note that the expert in *Marx* cautioned that the bite mark was particularly distinctive and expressed doubt about the value of less distinctive marks.[126] This cautionary caveat was overlooked by later courts drawing upon *Marx* as authority for the admissibility of bite mark evidence.[127] California is a *Frye* (or *Kelly*) jurisdiction.[128] Nevertheless, the court upheld the admission of the bite mark evidence not because bite mark identification was "generally accepted in the relevant scientific community" (the central requirement of the *Frye* rule), but because of two loopholes in the interpretation of *Frye*.[129] First, bite mark evidence, in contrast to polygraph evidence (about which *Frye* was concerned), was determined to be evidence that the jury could observe and interpret for itself, at least sufficiently so that it would not be compelled to adopt the expert's opinion entirely on faith.[130] Secondly, bite mark evidence was determined to be non-novel and therefore not subject to *Frye*—a decision concerned with a novel lie-detection technique.[131]

In a thorough review of the case law, Beecher-Monas categorized the courts' reasoning in admitting bite mark evidence as follows: some courts admit bite mark evidence because other courts have (for half a century);[132] some courts employ the same non-novelty loophole employed in *Marx*;[133] some courts have reasoned that bite mark evidence is not science and that *Daubert* does not apply to non-scientific evidence;[134] and some courts have employed this reasoning even after the U.S. Supreme Court decision in *Kumho Tire* (and subsequent revision of the FRE in 2000) made clear that "reliability" applies to all expert opinion evidence and the *Daubert* factors may be applied where appropriate.[135]

Bite mark identification evidence has been excluded in only a handful of cases. *Ege v. Yukins* is an interesting example.[136] The trial judge admitted the bite mark evidence.[137] Ege filed and won a federal habeas corpus claim based in part on the federal court's conclusion that the bite mark evidence "was unreliable and not worthy of consideration by a jury."[138] As it turns out, the court's judgment was case specific and did

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[124] *Id.*

[125] People v. Marx, 126 Cal. Rptr. 350, 350 (Cal. Ct. App. 1975); FAIGMAN ET AL., *supra* note 103, at 448.

[126] *Marx*, 126 Cal. Rptr. at 350.

[127] FAIGMAN ET AL., *supra* note 103, at 448.

[128] People v. Kelly, 17 Cal.3d 24, 30 (Cal. 1976).

[129] These loopholes should themselves be the topic of a separate study.

[130] The strangeness of this reasoning has been often discussed. FAIGMAN ET AL., *supra* note 103, at 449. The same reasoning was recently applied to fingerprint evidence as well in an unpublished decision. People v. Greenwood, No. BA351185 (Super. Ct. Cal. Cty. of Los Angeles 2010), *available at* http://www.swgfast.org/Resources/100210_CA-v-Greenwood_Schnegg_Order.pdf. *Frye* was based on a blood pressure test claimed to assist with lie detection.

[131] Cole, *Out of the Daubert Fire*, *supra* note 70, at 526.

[132] Beecher-Monas, *supra* note 122, at 1372.

[133] *Id.*

[134] *Id.* at 1373.

[135] *Id.* at 1397; FAIGMAN ET AL., *supra* note 103, at 457.

[136] Ege v. Yukins, 485 F.3d 364, 374-75 (6th Cir. 2007).

[137] *Id.* at 374.

[138] Ege v. Yukins, 380 F. Supp. 2d 852, 871 (E.D. Mich. 2005), *aff'd in part, rev'd in part* 485 F.3d 364 (6th Cir. 2007).

not apply to bite mark evidence more generally.[139] The court felt that the particular expert used at trial had "been cast into disrepute as an expert witness."[140] Of particular concern was the expert's attempt to attach something akin to an RMP to his testimony.[141] The expert testified that only 1 of 3.5 million people (the population of the city in which the crime occurred) would have dentition consistent with the bite mark.[142] There was, as the court accepted, no basis for this statement.[143]

At least two Oklahoma trial courts have excluded bite mark testimony, one in an unpublished decision.[144] In the reported case of *Garrison v. State*, the court excluded testimony attributing the bite mark to the defendant, but permitted testimony that the mark was a "probable bite-mark."[145] The defendant appealed the admissibility of this testimony and the failure of the trial court to conduct an admissibility hearing, but this appeal was rejected.[146] In *Howard v. State*, the Mississippi Supreme Court expressed some critical remarks about bite mark evidence while reversing Howard's conviction on other grounds.[147] After *Howard* was subsequently re-convicted and his conviction was again appealed, the court held, "without explanation," that the admission of the bite mark evidence was not an abuse of discretion.[148] In another case, one Mississippi Supreme Court justice dissented from an opinion upholding the admissibility of bite mark evidence.[149] In *State v. Adams*, a court precluded a physician who claimed no expertise in forensic dentistry from testifying as to whether a mark was consistent with being a bite mark.[150] In *State v. Fortin*, the court excluded experience based testimony concerning the rarity of a combination of bite marks on different parts of the body without a database upon which to base such an estimate,[151] a holding that presaged *R. v. T.*

Based on this record, the NRC report concluded, "[t]here is nothing to indicate that courts review bite mark evidence pursuant to *Daubert's* standard of reliability."[152]

4. Incriminating Images and Voice Recordings

a. Opinions about Images

Images have been admitted as evidence into U.S. courts for more than a hundred years.[153] In recent decades, in criminal proceedings, images have been used for purposes

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[139] Beecher-Monas, *supra* note 122, at 1394-95; FAIGMAN ET AL., *supra* note 103, at 453.

[140] *Ege*, 380 F. Supp. 2d at 857.

[141] *Id.*

[142] This terminology has been subject to scholarly and judicial censure, especially in Canada.

[143] FAIGMAN ET AL., *supra* note 56, at 13; A similar situation arose for latent print in *Michigan v. Ballard*. *See* Cole, *supra* note 70, at 120 (explaining that the ruling merely punishes forensic expert witnesses who make their baseless probability calculations quantitative and explicit, while rewarding witness who conceal their baseless probability calculations behind vague verbal formulations like "no one else in the world could be found consistent with this mark").

[144] FAIGMAN ET AL, *supra* note 56, at 15.

[145] *Id.*

[146] BEECHER-MONAS, *supra* note 122, at 1398; FAIGMAN ET AL, *supra* note 56, at 15.

[147] 701 So. 2d 274, 288 (Miss. 1997), *abrogated on other grounds by* Hearn v. State, 3 So. 3d 722 (Miss. 2008).

[148] FAIGMAN ET AL., *supra* note 56, at 17-18.

[149] *Id.* at 18.

[150] Marjorie A. Shields, Annotation, *Admissibility and Sufficiency of Bite Mark Evidence as Basis for Identification of Accused*, 1 A.L.R.6th 657 (2011).

[151] Mark Page et al., *Forensic Identification Science Evidence Since* Daubert*: Part II—Judicial Reasoning in Decisions to Exclude Forensic Identification Evidence on Ground of Reliability*, 56 J. FORENSIC SCI. 913, 914 (2011).

[152] NAT'L RESEARCH COUNCIL, *supra* note 15, at 107 n.81.

related to identification primarily in relation to robberies of banks, convenience and liquor stores with video surveillance facilities.[154]

American juries are permitted, and often required, to interpret surveillance images and make identifications, but in several cases both the state and/or defendants have sought to adduce expert opinion to assist with the interpretation of images.[155] In contrast to England, Canada and Australia, anthropometry—particularly the use of (reverse projection) photogrammetry—is pronounced in the United States.[156] Courts in the United States have been inconsistent in their responses to identification evidence as opposed to descriptions of similarities between a person of interest (POI) and the accused.[157] Generally, positive identification (or individualization) is allowed and on some occasions the inability of a defense expert to positively identify a POI or to exclude the accused, as opposed to criticizing assumptions and techniques, has led to the exclusion of their rebuttal evidence.[158]

United States v. Alexander is an early, though not entirely representative, example of the uses of images for identification purposes.[159] Alexander, a medical doctor, was accused of committing a bank robbery.[160] Three bank employees selected a photograph of Alexander when shown a photo array in the aftermath of the robbery. The state also called four acquaintances who supported the identification.[161] In response, Alexander called five witnesses "who stated that he was not the person photographed by the bank surveillance cameras."[162] Alexander also sought to adduce two expert witnesses—one specializing in cephalometrics and the other a former FBI agent with photographic comparison expertise—both opining that "it was impossible for Dr. Alexander to be the person depicted in the photographs."[163] Prior to *Daubert*, the trial judge excluded the expert witnesses called by the defense.[164] The Court of Appeals concluded that the trial court had abused its (considerable) discretion, explaining: "[b]ecause of the specific nature of the proffered testimony in this case, together with the complete lack of any evidence other than the eyewitness identification connecting Dr. Alexander to the robbery, we find that the district court's exclusion of Dr. Alexander's

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[153] *See* NEAL FEIGENSON & CHRISTINA SPIESEL, LAW ON DISPLAY: THE DIGITAL TRANSFORMATION OF LEGAL PERSUASION AND JUDGMENT 107 (2009); JONATHAN FINN, CAPTURING THE CRIMINAL IMAGE: FROM MUG SHOT TO SURVEILLANCE SOCIETY xii (2009); TAL GOLAN, LAWS OF MEN AND LAWS OF NATURE: THE HISTORY OF SCIENTIFIC EXPERT TESTIMONY IN ENGLAND AND AMERICA 176 (2004) [herinafter LAWS OF MEN]; Tal Golan, *The Emergence of the Silent Witness: The Legal and Medical Reception of X-rays in the USA*, 34 SOC. STUD. OF SCI. 469, 476 (2004); Jennifer L. Mnookin, *The Image of Truth: Photographic Evidence and the Power of Analogy*, 10 YALE J.L. & HUMAN. 1, 13 (1998).

[154] LAWS OF MEN, *supra* note 154, at 209-10.

[155] *See* United States v. Alexander, 816 F.2d 164, 166-67 (5th Cir. 1987); United States v. Johnson 575 F.2d 1347, 1361 (5th Cir. 1978).

[156] Photogrammetry is the process of obtaining information, usually measurements, from images. Lee Dechant, *How a Photogrammetry Expert Can Help You Win Your Case*, 14 NEV. LAW. 19, 19 (2006).

[157] *See* United States v. McGinnis, 201 F. App'x 246, 249-51 (5th Cir. 2006) (discussing expert qualification and the reliability of photogrammetry); *see also* United States v. Welch, 368 F.3d 970, 975 (7th Cir. 2004) (excluding expert testimony in favor of eyewitness identification).

[158] *See* United States v. Brewer 783 F.2d 841, 842 (9th Cir. 1986).

[159] *See* Michael W. Mullane, *The Truthslayer and the Court: Expert Testimony on Credibility*, 43 ME. L. REV. 53, 83-84 (1991).

[160] *Id.* at 83.

[161] *Id.*

[162] United States v. Alexander, 816 F.2d 164, 166 (5th Cir. 1987).

[163] *Id.* at 167. Cephalometrics involves measuring the head and its features.

[164] *See* Daubert v. Merrell Dow Pharm., 509 U.S. 579, 596 (1993).

expert witnesses was clearly erroneous."[165] The fact that the "entire case … turned on the photographic identification" rendered the exclusion erroneous.[166] The Court did not hold "that such evidence will always be admissible in every case."[167]

A more representative example of the willingness to exclude defense evidence emerged in *United States v. Dorsey*.[168] Dorsey adduced the opinions of two forensic anthropologists—that he was "not the individual depicted in the Bank … surveillance photographs"—at very short notice during his trial.[169] The trial judge excluded the evidence, questioning whether "this is a recognized science" and noting that all "we are doing here is … comparing some photographs."[170] The Court of Appeals concluded that the evidence was inadmissible under *Daubert*: not amounting to 'scientific knowledge' and not "helpful to a trier of fact."[171] Applying the *Daubert* criteria, the Court of Appeals noted that "Dorsey never contended anywhere in his brief, or during trial, that the forensic anthropologists' method of analysis had been tested."[172] Affirming, they explained: "there is no indication that the expert testimony was at all necessary in the instant case; … the comparison of photographs is something that can sufficiently be done by the jury without help from an expert."[173] The Court of Appeals was reassured in their exclusionary stance by the other evidence suggesting Dorsey's guilt.[174] In *United States v. Crotteau*, the defendant's attempt to call a friend as an expert witness who used crude measurements to compare two videos, one of Crotteau at a bank and the other of a bank robbery, was deemed inadmissible under the FRE.[175] Other friends of Crotteau were allowed to express their opinions about the identity of the bank robber as the state's lay "familiarity" witnesses.[176]

Many appeals against conviction involving the interpretation of images are based on grounds such as exclusion of the defendant's expert(s) was improper or, more commonly, that defense counsel was ineffective for failing to call (or apply for funding for) an expert in photographic interpretation (usually photogrammetry) to counter the state's expert or to explore problems and limitations. In the main, these appeals have been unsuccessful, largely because of the very onerous standards governing the review of decisions made by counsel and admissibility determinations (after *Joiner*).[177]

Generally the state has been allowed to call expert witnesses to testify about height, and similarities in features, and possessions (such as clothing), and sometimes even to positively identify the accused.[178] Figure 2 illustrates the comparison of clothing

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[165] *Alexander*, 816 F.2d at 167.

[166] *Id.* at 169.

[167] *Id.*; *see, e.g.*, United States v. McGinnis 201 F. App'x 246, 249-52 (5th Cir. 2006).

[168] 45 F.3d 809 (4th Cir. 1995).

[169] *Id.* at 811.

[170] *Id.* at 812.

[171] *Id.* at 814-15 (applying the *Daubert* criteria).

[172] *Id.*

[173] *Id.* at 815; *see* Claritt v. Kemp 336 F. App'x 869, 870 (11th Cir. 2009); *see also* United States v. Welch, 368 F.3d 970, 975 (7th Cir. 2004) (finding that the evidence was proposed primarily to cast doubt on the eyewitness testimony), *vacated*, 543 U.S. 1112 (2005).

[174] *Dorsey*, 45 F.3d at 815.

[175] 218 F.3d 826, 830 (7th Cir. 2000).

[176] *Id.* at 833.

[177] *See* General Electric Co. v. Joiner, 522 U.S. 136, 142 (1997).

[178] United States v. Brown, 511 F.2d 920, 924 (2d Cir. 1975); United States v. Fernandez, 480 F.2d 726, 735-36 (2d Cir. 1973) (determining height through superimposition).

photographed during a bank robbery (Figure 1). The Court in *United States v. Sellers* explained that expert testimony to assist the jury with identification would allow an "opinion as to whether the defendant is the person in the picture."[179] In *United States v. McKreith*, the FBI analyst's interpretation of video and still images, led him to testify that a shirt recovered from McKreith "matched the class characteristics of the shirt worn by the bank robber" and a black bag was "'indistinguishable' from the bag seen in the photos."[180] According to the Court of Appeals, Bruegge's opinions were properly admitted, able to be cross-examined and, given the strength of the case, if they were inadmissible his testimony was "harmless in light of the overwhelming evidence."[181] In *United States v. Cairns*, an FBI agent was allowed to testify about similarities in "the nose and mouth area, chin line, hair lines, ear contours and inner folds of the ears, among other things" and then proceeded to positively identify the defendant "or another individual having all of these characteristics."[182] In *United States v. Brown* the state's expert was allowed to take new photographs of the defendant at the bank and compare them with the surveillance images of the actual robbery to assist with identification.[183] Experts called by the state have been allowed to make positive identifications (i.e., to individualize) but have also been restricted, on occasion, to describing similarities between the accused and the person of interest—so-called "splitting."[184] Comparisons, and positive identifications, may be based upon clothing and accessories, weapons, and even mannerisms (such as handedness).[185]

[179] 566 F.2d 884, 886 (4th Cir. 1977).

[180] United States v. McKreith, 140 F.App'x 112, 114 (11th Cir. 2005) (involving Vorder Bruegge, perhaps the most ubiquitous of the United States expert witnesses).

[181] *Id.* at 116.

[182] 434 F.2d 643, 644 (9th Cir. 1970); *see also* Brown, 511 F.2d at 924 (describing ear lobes as "being like a fingerprint").

[183] 511 F.2d at 924; *see also Sellers*, 566 F.2d at 886. The trial court's refusal to support a similar defense request in *United States v. Armstrong* was not considered reversible error. 621 F.2d 951, 954-55 (9th Cir. 1980).

[184] United States v. Alexander, 816 F.2d 164, 168 (5th Cir. 1987); *see also* United States v. Demjanjuk, 367 F.3d 623, 631 (6th Cir. 2004) (where a great deal of time, such as 60 years, has passed); Cole, *supra* note 94, at 462.

[185] United States v. McGinnis, 201 F.App'x 246, 251 (5th Cir. 2006) (jeans); United States v. Johnson, 114 F.3d 808, 811-13 (8th Cir. 1997) (height, shoe size, and logo on baseball cap) *aff'd*, 278 F.3d 839 8th Cir. 2002); United States v. Quinn, 18 F.3d 1461, 1465 (9th Cir. 1994) (guns); People v. Smith, No. D035500, 2004 WL 406991, at *6 (Cal. Ct. App. May 29, 2004) (clothing, masks, and weapons). In *United States v. D'Ambrosio*, the analyst asserted that on the basis of similarities, a pair of the defendant's jeans "were the same" as those in the robbery video. 9 F.3d 1554 (9th Cir. 1993).

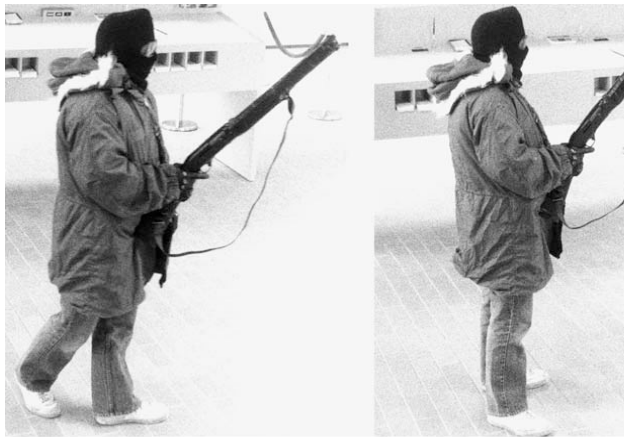


Figure 1: Security images taken during a bank robbery.

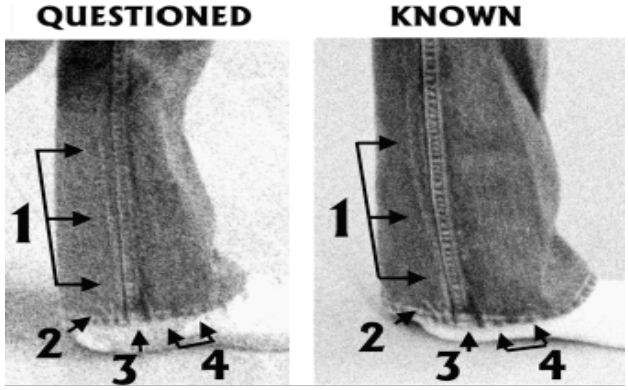


Figure 2: Detail of image of bank robbery ('Questioned' from left-hand image of Figure 1) and jeans belonging to the accused ('Known'). The condition of the seam was used to positively identify the jeans.[186]

Early challenges to the admissibility of the state's reverse projection photogrammetry were unsuccessful and consequently were transformed into grounds of appeal based on the failure of counsel to adequately cross-examine such witnesses or obtain similar expert assistance.[187] After *Daubert*, challenges to photogrammetry, in

[186] Images reproduced from Vorder Bruegge, *Photographic Identification of Denim Trousers From Bank Surveillance Film*, 44 J. FORENSIC SCI. 613-22 (1999); *see also* Kitty Hauser, *A Garment in the Dock; Or, How the FBI Illuminated the Prehistory of a Pair of Denim Jeans*, 9 J. MATERIAL CULTURE 293, 295-305 (2004).

[187] Claritt v. Kemp 336 F.App'x 869, 871 (11th Cir. 2009); Webster. v. Sec'y, DOC, 291 F. App'x 964, 966-67 (11th Cir. 2008); Chappel v. Garcia, No. CIV. S-03-0132, 2006 WL 1748424, at *39-40 (E.D. Cal. June 26, 2006) (noting that Superior Court opined that the decision not to consult his own photogrammetry expert was a

particular, have been unsuccessful[188] or seen as irrelevant.[189] Photogrammetry evidence often passes without comment or challenge.[190] An earlier defense challenge to the reliability of photogrammetry was rejected in *United States v. Everett*, where the perceived inability of the jurors to make an accurate assessment of heights from images was, along with the impartiality of the FBI witness, accepted.[191] More recently, photogrammetrists have tended to testify in terms of a range,[192] rather than a specific height[193] and increasingly tend to place emphasis on their ignorance of the height of the suspect prior to analysis of the images.[194]

In addition, and sometimes without objection or appeal, investigators and analysts are allowed to interpret and narrate images. In *The People v. Apodaca*, a detective was allowed to express his opinion about a video that was said to corroborate the account of the central prosecution witness.[195] Issues about enhancement have not been particularly controversial and even some minor losses from a recording might not render the remaining images inadmissible.[196]

A second strand of image evidence concerns attempts to determine whether an image is "real" or computer generated, an area of expertise that has become important in a sub-set of child pornography prosecutions. Some individuals so accused have offered as a defense the argument that the government cannot rule out the possibility that the image is computer generated, in which case it would not violate the law.[197] In *United States v. Frabizio*, the government initially proffered a computer scientist to testify as to whether child pornographic images depicted real children or were computer generated.[198] Apparently after defense counsel demonstrated that this expert's methods produced a high rate of errors, the government withdrew this expert and proffered an FBI photography expert, who made subjective experience based judgments to render conclusions on the

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reasonable tactical decision); *see also* Dixon v. Admin. Appeal Dep't Office of Info. & Privacy, No. 06 Civ. 6069, 2008 WL 216304, at *6-7 (S.D.N.Y. Jan. 22, 2008) *aff'd*, 336 F. App'x 98 (2d Cir. 2009); *cf.* Hutchinson v. Hamlet, 243 F. App'x 238, 240 (9th Cir. 2007) (challenging ineffective counsel for not obtaining expert assistance to challenge height evidence).

[188] *See, e.g.*, United States v. Kyler, 429 F. App'x 828 (11th Cir. 2011); United States v. Williams, 235 F. App'x 925, 928 (3d Cir. 2007); United States v. Quinn, 18 F.3d 1461, 1465 (9th Cir. 1994); United States v. Everett, 825 F.2d 658, 662 (2d Cir. 1987).

[189] Using "the varying heights of known objects in a photograph . . . to calculate the height of other objects in the photograph, does not require analysis under *Daubert*." McGrew v. Indiana, 673 N.E.2d 787, 798 n.10 (Ind. Ct. App. 1997) *aff'd in part, vacated in part*, 682 N.E.2d 1289 (Ind. 1997).

[190] *See* United States v. Bobbitt, Nos. 98-4489, 98-4490, slip op. at 2 (4th Cir. Jan 31, 2000); *see also* United States v. Smithers, 212 F.3d 306, 309 (6th Cir. 2000).

[191] 825 F.2d at 662.

[192] United States v. Kyler, 429 F. App'x 828, 831 (11th Cir. 2011).

[193] *E.g.*, United States v. Watson, No. 94-10354, 1995 U.S. App. LEXIS 26101, at *6 (9th Cir. Sept. 6, 1995) (precisely same height as accused based on DMV. records: 6'4").

[194] Chappel v. Garcia, No. CIV. S-03-0132, 2006 WL 1748424, at *4 (E.D. Cal. June 26, 2006) (Bruegge testified that when he "made his [height] estimates, he did not know . . . defendant's actual height.").

[195] Apodaca v. Horel, No. 1:08-CV-00414, 2009 WL 1357444, at *5 (E.D. Cal. May 13, 2009); *see also* Aviva Sports, Inc. v. Fingerhut Direct Mktg., Inc., 829 F. Supp. 2d 802, 834-36 (D. Minn. 2011) (granting in part and denying in part plaintiffs' and defendants' motions to exclude expert opinion testimony interpreting photographs in suit alleging violation of federal and state deceptive trade practices acts).

[196] Wisconsin v. Avery, 807 N.W.2d 638 (Wis. Ct. App. 2011) (digital video enhancement), *cert. granted*, 810 N.W.2d 221 (2012); United States v. Codrington, No. 07 MJ 118, 2008 WL 1927372 (E.D.N.Y. May 1, 2008) (upholding use of surveillance video where portions of the video were lost due to human error), *aff'd*, No. 08-MC-0291, 2009 WL 1766001 (2009).

[197] Ashcroft v. Free Speech Coalition, 535 U.S. 234, 263-64 (2002) (O'Connor, J., concurring).

[198] United States v. Frabizio, 445 F. Supp. 2d 152, 154 n.2 (D. Mass. 2006).

same question.[199] The government's apparent belief that the testimony based on a subjective judgment and experience was "more admissible" than testimony based on quantifiable, computer science methods has important implications for the subject of this article.[200] Judge Gertner excluded the testimony, based on extensive *Daubert* analysis. Judge Gertner concluded that the government had offered no evidence measuring the ability of the expert to correctly determine whether images were "real" or computer generated.[201] This ruling was later extended to a second proffered witness who used similar techniques.[202]

Interestingly, the government appears to have secured a legal fix for this issue with a subsequent ruling in *United States v. Rodriguez-Pacheco*, holding that expert testimony was not necessary for a court to conclude that an image depicted a real child.[203] Curiously, the expert witness in that case testified to his methodology for analyzing images, but not conclusions.[204] Neither the expert's methodology nor the nature of his expertise is clear from the opinion. The opinion holds that the court was competent to render the conclusion that the images depicted real children based solely on the *conclusion* of a pediatrician that the depicted individuals, if real, would be younger than 18 years old and the testimony of the photographic expert describing his methodology, but not his conclusion.[205]

b. Opinions about Voices (and Sounds)

In contrast to the other techniques discussed in this article, U.S. courts have been equivocal about the admissibility of speaker or voice "identification" evidence offered by professional experts (as opposed to "earwitnesses"), using techniques such as voice spectrography in recent decades. It also seems that the admissibility standard used by the court may influence the outcome of the admissibility ruling.[206] Historically, courts have tended to divide fairly evenly on whether to admit the evidence, with around 60 percent of cases resulting in admission, a pattern that appears to be consistent across time.[207] In a telling analysis, *Faigman et al.* show that the ultimate result has tended to hinge on whether the courts interpreted the "relevant scientific community"—referred to in *Frye*—narrowly as consisting of individuals who perform voice spectrography (thus resulting in admission) or broadly as consisting of a broader group of experts with knowledge relevant to claims of voice spectrographers such as audiologists, acousticians, electrical engineers, linguists, phoneticians, physicists, physiologists, psychologists, and statisticians (thus resulting in exclusion).[208] They also note that the 1979 publication of a National Academy of Science sponsored NRC report on voice identification, which might be conceived as similar to (if somewhat narrower in scope than) the more recent NRC response to the pattern recognition disciplines, had limited impact on court admissibility

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[199] *Id.*

[200] *Id.*

[201] *Id.* at 159 n.9.

[202] United States v. Frabizio, 463 F. Supp. 2d 111, 112-13 (D. Mass. 2006). *Contra* United States v. Christie, No. 07-332, 2009 WL 742722, at *1 (D. N.J. 2009) (expert evidence was admissible under *Daubert* in response to multiple images and video).

[203] United States v. Rodriguez-Pacheco, 475 F.3d 434, 438 (1st Cir. 2007).

[204] *Id.*

[205] *Id.*

[206] Michelle Meyer McCarthy, Annotation, *Admissibility and Weight of Voice Spectrographic Analysis Evidence*, 95 A.L.R. 5th 471 (2009).

[207] FAIGMAN ET AL., *supra* note 56, at 519.

[208] *Id.*

determinations.[209] Revealingly, only one third of subsequent opinions even cite it, and only one opinion suggests substantial engagement.[210]

Several courts have considered the admissibility of voice identification evidence after *Daubert.* The Alaska Supreme Court ruled that a trial court's admission of voice spectrography was not an abuse of discretion.[211] This was based on "a limited and superficial review of the research . . . doing little more than quoting the trial court's conclusory assertions".[212] Voice identification evidence has also been excluded after *Daubert*. A trial court excluded voice spectrography in *United States v. Bahena* (2000) as unreliable, and the Eight Circuit Court of Appeals upheld the decision.[213] In *United States v. Angleton* (2003), the trial court was quite critical of the evidence of reliability put forward.[214] In *United States v. Ramos* (2003) the Fifth Circuit Court of Appeals 'summarily' rejected the claim that exclusion was erroneous. [215] Voice identification evidence was also excluded under *Frye* in *People v. Persaud* (1996).[216] Voice identification evidence was excluded in *United States v. Ricketts* (2005) for lacking probative value.[217] Expert evidence as to whether the defendant had uttered an "intelligible vocalization[]" was also excluded on relevance grounds in *United States v. Naegele* (2007).[218] Not insignificantly, all of these cases concerned voice identification evidence proffered by defendants.[219]

In *State v. Cooke*, the trial court excluded what has been called "negative evidence" testimony proffered by the government—that is, testimony showing that efforts were made to perform voice identification, but that those efforts were unsuccessful.[220] So-called negative evidence is often used in order to correct for the imputed "CSI effect", in which it is claimed that jurors will assume that the absence of testimony about forensic techniques that the jurors believe are available to the government based on their experience viewing television dramas will lead them to infer either that tests excluded the defendant or that the government was negligent in not performing them.[221]

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[209] NAT'L RESEARCH COUNSEL, ON THE THEORY AND PRACTICE OF VOICE IDENTIFICATION 60 (Richard H. Bolt et al. eds., 1979) (explaining that the degree of accuracy and error rates vary from case to case due to the properties of the voices compared, the recording conditions used to obtain voice samples, the skill of the examiner, and the examiner's knowledge about the case. Estimates of error rates are available only for a few situations, and they "[d]o not constitute a generally adequate basis for a judicial or legislative body to use in making judgments concerning the reliability and acceptability of aural-visual voice identification in forensic applications."). *See also* Julie C. Reyonlds & Julius W. Weber, *The Admissibility of Spectrographic Voice Identification in the State Courts*, 70 J. CRIM. L. & CRIMINOLOGY 349, 354 (1973).

[210] FAIGMAN ET AL., *supra* note 56, at 522.

[211] State v. Coon, 974 P.2d 386, 402 (Alaska 1999).

[212] FAIGMAN ET AL., *supra* note 56, at 524.

[213] United States v. Bahena, 233 F.3d 797, 810 (8th Cir. 2000); McCarthy, *supra* note 207.

[214] United States v. Angleton, 269 F. Supp. 2d 892, 898-99 (S.D. Tex. 2003); McCarthy, *supra* note 207.

[215] United States v. Ramos, 71 F. App'x 332, 336 (5th Cir. 2003).

[216] People v. Persaud, 406 N.Y.S. 2d 261 (N.Y. App. Div. 1996).

[217] United States v. Ricketts, 141 F. App'x 93, 95 (4th Cir. 2005).

[218] United States v. Naegele, 471 F. Supp. 2d 152, 159 (D.C. Cir. 2007). This issue assumed significance in a very high profile mass-murder exoneration in New Zealand. *See Bain v. Queen* [2009] NZSC 16 (SC) [2], [5]-[8], [68] (N.Z.).

[219] *Ricketts*, 141 F. App'x at 95; United States v. Ramos, 71 F. App'x 334, 335 (5th Cir. 2003); United States v. Bahena, 223 F.3d 797, 802 (8th Cir. 2000); *Naegele*, 471 F. Supp. 2d at 159; United States v. Angleton, 269 F. Supp. 2d 892, 893 (S.D. Tex. 2003); People v. Persaud, 640 N.Y.S.2d 261, 403 (N.Y. App. Div. 1996).

[220] State v. Cook, 914 A.2d 1078, 1096 (Del. Super. Ct. 2007).

[221] Simon A. Cole & Rachel Dioso-Villa, *Investigating the 'CSI Effect' Effect: Media and Litigation Crisis in Criminal Law*, 61 STAN. L. REV. 1335, 1344 n.48 (2009).

B. England and Wales: Admissibility Standards, Jurisprudence, and Practice

An attempt to state the principles that govern the reception of expert evidence in England and Wales is, in some respects, a relatively simple undertaking. Admissibility is governed for the most part by common law principles.[222] English courts have adopted a characteristically pragmatic approach to determining whether a witness's skills and experience are such that he or she is qualified to provide expert testimony. The essential question is whether the witness can satisfy the court that he or she has "sufficient familiarity with and knowledge of the expertise in question to render his opinion potentially of value."[223]

Perhaps the most significant obstacle to the reception of a suitably qualified expert's testimony is the principle identified by the Court of Appeal in *R. v. Turner*:[224]

> An expert's opinion is admissible to furnish the court with scientific information which is likely to be outside the experience and knowledge of a judge or jury. If on the proven facts a judge or jury can form their own conclusions without help, then the opinion of an expert is unnecessary[.][225]

This principle is considered by many commentators to be an expression of the *common knowledge* rule. The Law Commission interpreted it to require expert evidence to have sufficient probative value to be of assistance to the fact-finder in resolving the issues in the case.[226] In concentrating attention on the assistance that might be derived from developments in science and technology, the courts have elided the significance of reliability.[227] In *R. v. Dallagher*,[228] the Court of Appeal suggested that the English approach was analogous with that established by rule 702 of the U.S. Federal Rules of Evidence.[229] However, the analogy is tenuous. *Daubert* and the text of rule 702 indicate that expert testimony will only assist the tribunal of fact if it is the product of reliable theories and techniques. While *Daubert* provides criteria for the evaluation of scientific and other forms of expert testimony, English courts have taken the view that reliability is primarily an issue for the tribunal of fact in determining the weight to be attached to such evidence, and have declined to identify any specific criteria relating to reliability as a condition of admissibility.

In recent judgments, rather worryingly, the Court of Appeal has cast doubt on the credentials of witnesses called to give expert opinion (almost exclusively for the defense) who have no clinical or investigative experience with the methods or techniques to which

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[222] *See* PAUL ROBERTS & ADRIAN ZUCKERMAN, CRIMINAL EVIDENCE (2nd ed. 2010); MIKE REDMAYNE, EXPERT EVIDENCE AND CRIMINAL JUSTICE (2001); TRISTRAM HODGKINSON & MARK JAMES, EXPERT EVIDENCE: LAW AND PRACTICE (2010).

[223] Barings v. Coopers & Lybrand (No. 2) [2001] Lloyd's Rep. Bank. 85 (Eng.); *see also* R. v. Robb, [1991] 93 Cr. App. R. 161, 164-65 (Eng.); R. v. Stockwell [1993] 97 Cr. App. R. 260, 264-66 (Eng.).

[224] R. v. Turner, [1974] QB 834 (Eng.).

[225] *Id.* at 841.

[226] Law Commission of England and Wales, Report on *Expert Evidence in Criminal Proceedings in England and Wales* (London: The Stationery Office, 2011) 2.17. Roberts and Zuckerman have taken it to be the articulation of a broader 'helpfulness' principle.

[227] Ian Dennis, THE LAW OF EVIDENCE 895 (London, Sweet & Maxwell, 4th ed. 2010).

[228] [2003] 1 Cr. App. R. 12.

[229] The practice may be analogous, but the governing rules are distinctively different.

their opinions relate.[230] This trend appears to be predicated on the misguided assumption that those who have considerable knowledge and understanding of scientific and methodological principles generally can say nothing of value about the application of those principles in particular forensic contexts. In *R. v. Weller*,[231] the Court went so far as to issue an admonishment to parties (in practice, the defense):

> [W]e do hope that the courts will not be troubled in future by attempts to rely on published work by people who have no practical experience in the field and therefore cannot contradict or bring any useful evidence to bear on issues that are not always contained in scientific journals.[232]

A peculiar feature of English appellate decisions is the frequency with which the South Australian Supreme Court's decision in *R. v. Bonython* is cited as a statement of the rules that govern the reception of expert evidence in England and Wales. One of those rules is that the subject matter of an expert's testimony must form "a body of knowledge or experience which is sufficiently organized or recognized to be accepted as a reliable body of knowledge or experience."[233] The prevailing view in several Australian states seems to be that this principle embodies an approach that is similar to that established by *U.S. v. Frye*.[234] This is not to say that a *Frye*-like test forms any part of the common law in England and Wales (or Australia), for although the Court of Appeal has cited the relevant passage in *Bonython* with some regularity, there has been no pause to consider its meaning or to focus attention on the acceptance (or reliability) of techniques and opinions.[235]

Interestingly, the Law Commission of England and Wales suggested that recent appellate decisions confirm the existence of a common law reliability threshold.[236] In *Reed & Reed*[237] the Court of Appeal held that "a court *must* consider whether "the subject matter of the evidence [is] part of 'a body of knowledge or experience which is sufficiently organised or recognised to be accepted as a reliable body of knowledge or experience.'"[238] Despite the obvious allusion to *Bonython*, the Court explained that this did not constitute an enhanced test of admissibility for expert (scientific) evidence:

> [E]xpert evidence of a scientific nature is not admissible where the scientific basis on which it is advanced is insufficiently reliable for it to be put before the jury. There is, however, no enhanced test of

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[230] See, for example, the Court of Appeal's observations regarding the experience of the expert called by the defense to provide opinions relating to the reliability of LCN DNA analysis in R. v. Reed & Reed [2009] EWCA Crim 2698, at [106-110]: "He bases much of his knowledge of DNA and the analysis of Low Template DNA on papers and discussion with other scientists; he does not conduct laboratory research . . . his expertise on the interpretation of DNA profiles is limited, without any relevant first hand laboratory research experience. He is not qualified to make a scene of crime investigation."

[231] [2010] EWCA Crim 1085.

[232] *Id.* at [38].

[233] R. v. Bonython (1984) 38 SASR 45.

[234] In *Kastelein v. Newmont Australia Ltd*, [2006] N.T.M.C. 081, for example, the Northern Territory Work Health Court suggested that in *Runjanjic*, King C.J. had applied the test set out in *Frye*. In Mallard v. The Queen [2003] W.A.S.C.A. 296 (December 3, 2003), the Supreme Court of Western Australia cited *Runjanjic* and the South Australian Supreme Court's decision in *Karger*, S.A.S.C. 64 (March 29, 2001), in support of its observation that 'the Frye test has been adopted in a number of Australian jurisdictions'; [2003] W.A.S.C.A. 296 at [285]. In the latter case, the South Australian Supreme Court, after close analysis of the judgment of King C.J. in Bonython, concluded: 'It is clear from his judgment that King CJ was accepting the [*Frye*] general acceptance test'; at [178].

[235] Roberts, 'Rejecting General Acceptance'; Law Commission, *Expert Evidence*, 2.12.

[236] LAW COMM'N, *supra* note 24, at 14.

[237] [2010] 1 Crim. App. 23 (Eng.).

[238] *Id.* at [111].

> admissibility for such evidence. If the reliability of the scientific basis for the evidence is challenged, the court will consider whether there is a sufficiently reliable scientific basis for that evidence to be admitted, but, if satisfied that there is a sufficiently reliable scientific basis for the evidence to be admitted, then it will leave the opposing views to be tested in the trial.[239]

It seems, then, that *Bonython's* acceptance-orientation has been assimilated into the common law in England and Wales in a way that leaves it devoid of any real meaning. In practice, the common law test of admissibility does not appear to establish anything more substantial than the general position expressed in various appellate court judgments that expert evidence is subject to the "'ordinary tests of relevance and reliability.'"[240]

In view of this, it might be no surprise that trial judges' decisions to admit incriminating expert opinion of questionable reliability have, with a few exceptions, been generally endorsed by the Court of Appeal. A striking example of this tendency is the decision in *Dallagher*, in which the Court rejected a challenge to the admissibility of expert opinion concerning latent ear print impressions.[241] The witness allowed to express an opinion at trial was a Dutch police officer who had developed an interest in ear prints.[242] His evidence was, having compared an ear print found on a window at the crime scene with a print taken from the appellant, he was able to conclude that the print found at the crime scene had been left by the appellant.[243] The foundation for this conclusion was a portfolio of 600 photographs and 300 ear prints compiled by the officer in which he had not found two ear prints that were alike in every detail.[244] Although the police officer and a second expert witness conceded that the assumption that ear prints taken from any two persons are distinguishable was based on limited experience and had little empirical support, the Court of Appeal took the view that the trial judge could not possibly have concluded that the evidence was so unreliable that it ought to be excluded.[245] In other

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[239] *Id.*

[240] *E.g.*, R. v. Dallagher, [2003] 1 Crim. App. 12 at [29] (Eng.). The source of this principle is one of the most well-established texts on the law of evidence in England and Wales, *Cross and Tapper on Evidence*. "The better, and now more widely accepted, view is that so long as the field is sufficiently well-established to pass the ordinary tests of relevance and reliability, then no enhanced test of admissibility should be applied, but the weight of the evidence should be established by the same adversarial forensic techniques applicable elsewhere." COLIN TAPPER, CROSS & TAPPER ON EVIDENCE 523 (9th ed. 1999). The text cites the Canadian Supreme Court decision in R. v. Mohan, [1994] 2 S.C.R. 9 (Can.), discussed below, as authority for this proposition. In light of subsequent cases, however, support for this proposition can no longer be found in the jurisprudence of the Canadian Supreme Court. *See* Christophe Champod et al., *Earmarks as Evidence: A Critical Review*, 46 J. FORENSIC SCI. 1275 (2001) (explaining that there are weaknesses in earmark evidence knowledge base).

[241] 1 Crim. App. at [29].

[242] *Id.* at [9].

[243] Gary Edmond, *Is Reliability Sufficient? The Law Commission and Expert Evidence in International and Interdisciplinary Perspective: Part 1*, 16 INT'L J. EVIDENCE & PROOF 30, 56 (2012) [hereinafter *Reliability*] ("[T]he expert witness might have explained merely that there were consistencies and no inconsistencies as between the defendant's ear print and those from the scene, and given an account of the probability of them coming from the same person.").

[244] *Dallagher*, 1 Crim. App. 12 at [9].

[245] *Id.* at [14], [23]. The salutary postscript in this case is that prior to the re-trial ordered by the Court, the defense submitted genetic material that had been lifted from the crime scene along with the latent print for DNA analysis. At the re-trial the prosecution offered no evidence after analysis of the material suggested that the source of the material and therefore the print was someone other than the appellant. Sean O'Neill, *Expert Evidence Flaws Clear 'Earprint Killer*,' THE TELEGRAPH (Jan. 23, 2004, 12:01 AM), http://www.telegraph.co.uk/news/uknews/1452346/Expert-evidence-flaws-clear-earprint-killer.html. See generally Simon A. Cole, *Forensics Without Uniqueness, Conclusions Without Individualization: The New Epistemology of Forensic Identification*, 8 LAW, PROBABILITY & RISK 242-43 (2009), for a discussion on the

cases, even where the error rate of a technique has been found to be significant (as great as 50 per cent), courts have been willing to admit the opinion.[246] The general view is that reliability is primarily an issue for the tribunal of fact rather than a factor regulating admissibility.

Trial judges in England and Wales also have discretion, under section 78 of the *Police and Criminal Evidence Act* 1984, to exclude evidence the reception of which would have an adverse effect on the fairness of proceedings.[247] Though there is little guidance on the exercise of this discretion, it seems that expert evidence might be excluded where it is presented in a form that would not enable it to be adequately tested through cross-examination. In *R. v. Otway*,[248] for example, the question of whether the methods used by an expert were "sufficiently explained to be tested in cross-examination and so to be verifiable or falsifiable"[249] was considered to be a matter that was the province of a trial judge in determining exclusion under section 78.[250] Similarly, the Court observed in *R. v. Ahmed*,[251] that an expert's refusal to disclose the material that formed the basis of his or her testimony, thus rendering it unchallengeable, "would be *likely* to be a reason for refusing to admit it."[252] Notwithstanding these instances, the exclusionary discretion is typically applied with a very light touch.[253]

The prevailing *laissez faire* approach to the admissibility of expert evidence in England and Wales presumes that juries possess the capacity to distinguish reliable from unreliable expert testimony and attach appropriate weight.[254] However, a series of recent appellate court decisions seem to belie this presumption.[255] These have established that where there is uncontradicted and unequivocal expert evidence, the jury must be directed that it is to accept the expert evidence, it cannot substitute the expert's views with its own.[256] More recently, in *R. v. Henderson*, the Court of Appeal acknowledged the

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difference between the "banal" observation that skin surfaces are unique and a measurable scale of detection that relates to uniqueness.

[246] In *R. v. Luttrell*, [2004] 2 Crim. App. 31 (Eng.), for example, a lip-reading expert was permitted to give incriminating evidence of the words allegedly spoken by the appellants in a surveillance video. This was so notwithstanding that tests previously conducted in order to ascertain her accuracy revealed that in video recording of conversation—containing 890 known words—revealed her accuracy to be about 50 percent. *Id.* at [13]. She also reported over 224 words that were not spoken. *Id.* The Court of Appeal concluded that the trial judge in *Luttrell* had been entitled to admit the expert's evidence. *Id.* at [38]. It was accepted that lip-reading evidence may fall "significantly short of perfection," and that this required the jury to be warned of the limitations of this kind of evidence. *Id.* at [42], [44].Though, there is no general requirement to issue a warning to a jury regarding the reliability of expert evidence. *See id.* at [42] (explaining that a warning is necessary when there is particular evidence about which the jury should be cautioned).

[247] Police and Criminal Evidence Act, 1984, § 78 (Eng.).

[248] [2011] EWCA (Crim) 3 (Eng.).

[249] *Id.* at [17] (quoting *Luttrell*, [2004] 2 Crim. App. 31 at [34]).

[250] *Id.* at [17], [19]-[20].

[251] [2011] EWCA (Crim) 184 (Eng.).

[252] *Id.* at [68] (emphasis added).

[253] LAW COMM'N, THE ADMISSIBILITY OF EXPERT EVIDENCE IN CRIMINAL PROCEEDINGS IN ENGLAND AND WALES: A NEW APPROACH TO THE DETERMINATION OF EVIDENTIARY RELIABILITY, 2009, Consultation Paper 190, ¶ 3.14. Although the Law Commission has suggested that "the courts permit the adduction of any expert evidence so long as it is not patently unreliable," *id.*, there are a number of appellate cases that cast doubt on the claim that such evidence will be excluded.

[254] *See, e.g.*, R. v. Henderson, [2010] 2 Crim. App. 24, [74]-[77] (Eng.).

[255] *See, e.g.*, Anderson v. R., [1972] A.C. 100 (P.C.) (Eng.); *see also* R. v. Sanders, [1991] 93 Crim. App. 245 (Eng.).

[256] *See, e.g.*, *Anderson*, A.C. at 106 (holding that it was "serious misdirection[]" to instruct the jury to disregard the evidence of an expert); *see also Sanders*, 93 Crim. App. at 248, 250 (holding that a judge is not required to

difficulties that juries will inevitably encounter in evaluating some forms of expert testimony, particularly conflicting medical opinion.[257] The Court acknowledged that in such cases there is a real risk of juries reaching verdicts that do not have a logical basis, and ventured that:

> [T]o suggest, in cases where the expert evidence is fundamental to the case, that the jury should approach [the] expert opinion in the same way as they do in every other criminal case, is inadequate … Juries, we suggest, should not be left in cases requiring [proof beyond reasonable doubt] to flounder in the formation of a general impression. A conclusion cannot be left merely to impression … a jury needs to be directed as to the pointers to reliable evidence and the basis for distinguishing that which may be relied upon and that which should be rejected.[258]

Rather than reflect on whether more rigorous scrutiny of expert evidence was required at the admissibility stage, the response to this concern over the ability of the jury to undertake this task satisfactorily was resort to jury directions and cautionary warnings. The jury should be asked to consider, among other things, whether the witness has strayed beyond the area of his or her expertise, if the witness is able to point to a recognized peer reviewed source for his or her opinions, and whether the expert has recent or contemporary clinical (practical) experience of the matters on which he or she is testifying.

Overall, English jurisprudence and practice is impoverished. There are few obstacles to the reception of incriminating expert opinion evidence. Although there appear to be significant reservations about the ability of advocates to expose the flaws in expert evidence, and the capacity of juries to undertake satisfactory evaluation of it, the general approach to admissibility appears to be grounded on contrary assumptions.

In March 2011, the Law Commission released a report on *Expert Evidence in Criminal Proceedings in England and Wales*.[259] The report recommends the codification of the common law rules supplemented by an explicit reliability standard which would replace the "rudimentary" version associated with the common law, *Bonython*, and *Reed*.[260] Patently influenced by *Daubert* and the revised FRE, a draft bill sets out several factors that might assist a trial judge to determine whether expert opinion evidence is "sufficiently reliable" to admit.[261] The Commission, in addition, recommended greater

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remind a jury about evidence to the contrary of expert testimony). *But c.f. Walton v. R.*, [1978] A.C. 788 (P.C.) at 793 (Eng.) (holding that a jury is not required to accept expert testimony as conclusive).

[257] *See Henderson*, [2010] 2 Crim. App. 24 at [218]-[19] (Eng.).

[258] *Id.* at [218].

[259] LAW COMM'N, *supra* note 24.

[260] *Id.* at 15-16, 18-19.

[261] *Id.* at 3, 18 (discussing the influence of the United States' Federal Rules of Evidence); *Id.* at 83 (discussing Daubert v. Merrell Dow Pharm., 509 U.S. 579 (1993)); *Id.* at 148 (clause 4 of the draft bill); *Id*. at 157 (schedule, part 1 of the draft bill); Roberts, *supra* note 24 (explaining the three factors proposed by the Commission to help judges determine admissibility of scientific evidence); *see* Gary Edmond & Andrew Roberts, *The Law Commission's Report on Expert Evidence in Criminal Proceedings*, 11 CRIM. L.R. 844, 844-848 (2011) [hereinafter *The Law Commission's Report*] (explaining the draft proposals of the Law Commission and the difficulties trial judges will face with their implementation); *see generally* LAW COMM'N, *supra* note 254, at 33-41 (laying out the proposals of the Law Commission's draft bill).

scope for judicial review of admissibility decisions, increased use of court-appointed experts at the admissibility stage, and further education for lawyers and judges.[262]

1. Latent Fingerprint Evidence

As in other jurisdictions, there is long-standing acceptance of fingerprint examiners' claims that fingerprints are uniquely distinctive. For many years identification (i.e., individualization) on the basis of fingerprints was predicated on an expert finding 16 points of similarity. The formal adoption of a non-numeric approach was precipitated by the decision in *R. v. Buckley*, in which the Court of Appeal held that where there were eight or more points of similarity, a trial judge "may or may not exercise his or her discretion in favour of admitting the evidence."[263] The Court suggested that the manner in which the discretion is exercised would depend on the experience and expertise of the witness, the number of similar ridge characteristics, whether there are any dissimilar characteristics, and the size and quality of the crime scene print.[264]

The validity of fingerprint evidence has not been subjected to serious or sustained challenge in England and Wales and it seems doubtful that this position will change if the *Daubert*-like approach to admissibility proposed by the Law Commission is enacted.[265] The Commission's draft legislation identifies a number of reasons why expert testimony might not be "sufficiently reliable," among which are that the opinion is based on a hypothesis that has not been subjected to sufficient scrutiny, and that the opinion is based on an unjustifiable assumption.[266] Latent fingerprint evidence might be challenged on either of these grounds. However, the Law Commission envisages that the reliability test need not be applied where the party objecting to admissibility is unable to satisfy the trial judge that the evidence might not be reliable.[267] It cited the remote possibility that two persons will have the same fingerprints as one example of circumstances in which it might not be necessary to apply the reliability test.[268] Were the courts to look to the Commission's report for guidance, if the draft legislation is enacted, it seems unlikely that any challenge to the validity of the claims that fingerprints are unique, and that individuals can be positively identified will be entertained.

As things stand, fingerprint examiners are routinely allowed to assert that a defendant is the unique source of a latent fingerprint found at a crime scene and the courts appear to readily accept such testimony.[269] There is no requirement that the jury be warned about any dangers or limitations.[270]

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[262] LAW COMM'N, *supra* note 24, at 181-82, 195-96; *see also* Edmond & Roberts, *supra* note 32, at 368 (discussing the relationship between the fundamental principles of evidence law and expert evidence) and Edmond, *supra* note 244 (assessing the Law Commission's report and proposals).

[263] [1999] EWCA (Crim) 1191 (Eng.).

[264] *Id.*

[265] *See The Law Commission's Report*, *supra* note 262, at 860 (discussing the "serious problems" with such evidence in England and Wales that the Commission's recommendations are unlikely to solve).

[266] LAW COMM'N, *supra* note 24, at 61.

[267] *Id.* at 32 (explaining that when there is "no meaningful dispute" the court may "disapply" the test).

[268] *Id.* at 32 n.65.

[269] *See, e.g.*, R. v. Arbia, [2010] EWCA (Crim) 2417, [8] (Eng.); R. v. Brown, [2011] EWCA (Crim) 80, [10] (Eng.).

[270] The inquiry in Scotland following *HM Advocate v. Shirley McKie* (1999) (acquitting McKie of perjury after she stated fingerprints collected at a crime scene were not attributable to her), along with several other national and international mistakes, have caused some disturbance in the United Kingdom. *See* SIR ANTHONY CAMPBELL, THE FINGERPRINT INQUIRY REPORT 600, § 34.21 (2011).

2. DNA Evidence

Although it has not benefitted from the unencumbered route into criminal proceedings that fingerprint evidence enjoyed, the science of DNA analysis has been broadly accepted. In *Gordon*, for example, the Court of Appeal stated that it had no doubts over the validity and value of DNA evidence in general, suggesting that "unlike fingerprinting, a DNA profiling match is not unique."[271] The challenge that the Court considered was not to the validity of DNA analysis generally, rather to the manner in which the expert had arrived at the match probability.[272] Anticipating the effect that probabilities running into many millions to one may have on juries, the Court accepted that the jury in the particular case may not have convicted had it had the benefit of expert evidence concerning the effect on the match probability of variation produced by differing equipment and the tolerances that are applied in the subjective process of comparison.[273] Although such issues remain salient, they have not received close attention in any subsequent appellate proceeding.[274]

While it appears to be presumed that the jury has the capacity to evaluate the (partially subjective) analysis that results in a random match probability, in *Adams*, the Court of Appeal deprecated defense use of Bayesian analysis to evaluate the probability that the defendant left the genetic material at the crime scene on which DNA analysis had been conducted.[275] The Court doubted whether the jury should be led into the realms of theory and complexity that the presentation of a Bayesian approach to evidence would entail.[276]

The most significant recent challenge in the United Kingdom has been to the admissibility of LCN DNA analysis, a relatively new technique that enables DNA alleles found in very small samples of genetic material to be amplified in order to obtain a DNA profile that can be used for forensic analysis.[277] Doubts were expressed over the reliability of LCN DNA analysis in *R. v. Hoey*,[278] a first instance decision in Northern Ireland.[279] The problem is that the quantities of DNA available for analysis are so small that the process used to amplify the samples is susceptible to statistically random (i.e., stochastic) effects, which give rise to a risk of both false positive and false negative results. More recently, however, the Court of Appeal has admitted the testimony of biologists, about the significance of LCN DNA results, in circumstances where the analyst was unable to attach a mathematical expression in the form of a RMP or likelihood ratio.[280]

In *Reed & Reed*,[281] the Court of Appeal held that evidence of LCN DNA analysis on samples of genetic material that were not susceptible to stochastic effects were

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[271] R. v. Gordon, [1995] 1 Crim. App. 290 at 290, 294 (Eng.).

[272] *Id.* at 296.

[273] *Id.* at 295-96.

[274] In *R. v. Hookway*, [2011] EWCA (Crim) 1989, [15]-[20], [33] (Eng.), the Court of Appeal rejected a submission that disagreement between experts over the appropriate statistical model for generating a random match probability in relation to LCN DNA warranted exclusion of the evidence. Such disagreement ought to be addressed in an appropriate direction to the tribunal of fact. *Id.* at [33].

[275] R. v. Adams, [1998] 1 Crim. App. 377 at 383-84 (Eng.).

[276] *Id.* at 384.

[277] *See* David Bentley & Peter Lownds, *Low Template DNA*, 1 ARCHBOLD REV. 6, 6-7 (2011) (explaining the current court challenges to low template DNA admissibility and procedures in the U.K.).

[278] [2007] NICC 49 (N. Ir.).

[279] *See* Charles Foster, Comment, *Untwining the Strands*, 158 NEW L.J. 157, 157 (2008).

[280] R. v. Dlugosz [2013] EWCA (Crim) 2 (Eng.).

[281] [2009] EWCA (Crim) 2698 (Eng.). .

admissible and suggested that even where there was a risk of them occurring the expert evidence may still be admissible.[282] In *Broughton*,[283] the Court was more emphatic, declaring:

> In our judgment, the science of [LCN DNA] is sufficiently well established to pass the ordinary tests of reliability and relevance and it would be wrong wholly to deprive the justice system of the benefits to be gained from the new techniques and advances which it embodies, in cases where there is clear evidence … that the profiles are sufficiently reliable.[284]

Generally, evidence that was susceptible to random statistical effects would be admissible where repeat testing (even a low number of repeat tests) produced consistent results.[285] In cases where the profiles generated were "wholly and obviously unreliable," it was envisaged that the prosecution would not seek to rely on them, and if it did, then the trial judge ought to exclude the evidence if he or she considered them unreliable.[286] In cases in which the probative value of the profiles was more debatable, the evidence may properly be adduced and its weight established by 'adversarial forensic techniques.'[287] The Court of Appeal appears to have great faith in the capacity of pre-trial management hearings, which impose various reporting duties on experts, on prosecutorial restraint, and the ability of advocates to reveal in cross-examination any shortcomings in methodology used and opinions expressed by expert witnesses to address the uncertainties surrounding such nascent forensic techniques.[288] Where the empirical basis for opinions proffered by an expert has been inadequate, the court has resorted to the "experience of the expert" as a means of bridging the scientific gap.[289] In *Reed & Reed*, although the Court acknowledged that with respect to the mechanisms through which DNA may be transferred from one object or place to another, there was little research and much more was needed, an expert could still enumerate the possible means of transfer of small quantities of DNA.[290] The admissibility of this form of expert evidence was renewed in *Weller*.[291] The appellant submitted that if a proper review of the scientific literature concerning transfer of DNA were to be undertaken, it would show that the state of scientific knowledge to be such that no evaluative judgment on the possible means of transfer could be made.[292] This submission was rejected by the Court of Appeal, which was satisfied that an expert's practical experience could provide 'a sufficiently reliable scientific basis for a forensic science officer to give evidence of the evaluation of the possibilities of transfer' in the circumstances of the particular case.[293]

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[282] *Id.* at [114].

[283] R. v. Broughton, [2010] EWCA (Crim) 549 (Eng.).

[284] *Id.* at [36].

[285] *See* Andrew Roberts, *Drawing on Expertise: Legal Decision-Making and the Reception of Expert Evidence*, 6 CRIM. L.R. 443, 446 (2008) ("[W]here the validity of a new hypothesis or method is demonstrated through repeat testing it might come to be so widely accepted as methodologically sound and reliable that it may be judicially noticed.").

[286] *Broughton*, [2010] EWCA (Crim) at [35].

[287] R. v. Broughton, [2010] EWCA (Crim) 549, [36] (Eng.).

[288] *See id.* at [32].

[289] *Id.* at [32].

[290] R. v. Reed, [2009] EWCA (Crim) 2698, [119] (Eng.).

[291] R. v. Weller, [2010] EWCA (Crim) 1085, [45] (Eng.).

[292] *Id.* at [23].

[293] *Id.* at [44].

3. Bite Marks

Bite mark evidence has not attracted the degree of judicial scrutiny in England and Wales that it has in other jurisdictions.[294] It seems that odontologists have been permitted to proffer a range of opinion on the significance of similarities found in the bite mark impressions left on the skin of a victim of crime (or an object found at the scene of a crime) and dental impressions taken from a defendant.[295] In some cases, this appears to have been restricted to evidence that an impression left on a victim corresponds with an impression of a defendant's teeth.[296] In others, it has been claimed on the basis of similarities in such impressions, that the defendant was the source of the bite marks.[297] It would be in keeping with the approach in respect of other forms of forensic science and medical evidence for experts to be given significant latitude in the terms used to state the significance of their findings where the basis for the evaluation is their own experience.[298]

4. Incriminating Images and Voice Recordings

Incriminating expert opinions concerning identification from voice recordings and images are routinely admitted in criminal proceedings in England and Wales. In common with other forms of forensic comparison evidence, the reliability of the techniques that form the basis of such opinion is not subject to any form of rigorous scrutiny for the purposes of determining admissibility.

a. Image Comparison Evidence (So-Called 'Facial Mapping')

A range of individuals with expertise and/or experience in anatomy, medical art, photography, information technology and military intelligence (and so on) have been allowed to interpret images and express opinions about the identity of persons of interest appearing in them. In addition, police and other investigators are entitled to express opinions about identity from repeated exposure to images. There is, in contrast to Australia (and Canada), no need for prior familiarity (with the suspect/POI) or something beyond what a jury might be able to do through its own examination of the images and the accused during the course of a trial.

Since the 1980s, courts have been admitting identification evidence derived from photographs—initially of soccer riots and robberies—by investigators and more recently digitally-recorded images and videos, analyzed by a range of investigators and consultants.[299] Since the early 1990s, English courts have allowed police officers and other witnesses—formally qualified as expert witnesses and frequently described as "facial mappers"—to express incriminating opinion evidence, even in circumstances where the CCTV evidence and the witnesses' interpretation was the only evidence against the

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[294] *See, e.g.*, R. v. Bourimech, [2002] EWCA (Crim) 2089, [13] (Eng.); R. v. Singleton, [1995] 1 Crim. App. 431 at 434 (Eng.); R. v. Egan, [1992] 95 Crim. App. 278 at 280 (Wales).

[295] *See* R. v. Egan, [1992] 95 Crim. App. 278 at 280 (Wales); R. v. Bourimech, [2002] EWCA (Crim) 2089, [13] (Eng.).

[296] In *R. v. Bourimech*, a forensic odontologist read a statement to the jury: "to the effect that there was no doubt that the bite mark to the complainant's left shoulder corresponded in detail with the dental impressions taken from the appellant." [2002] EWCA (Crim) 2089, [13]. *See also, e.g.*, R. v. Singleton, [1995] 1 Crim. App. 431 at 434 (Eng.) (finding a match between a cast of the defendant's teeth and bite marks found on the victim, a forensic odontologist claimed the marks identified the defendant as the assailant).

[297] *See* R. v. Egan, [1992] 95 Cr. App. R. 278 at 280 (Wales) ("She had a bite mark on her lower right thigh which on the evidence of an odontologist must have been caused by the appellant.").

[298] *See* R. v. Liverpool City Council, [2007] EWHC (Admin) 1477, [46] (Eng.).

[299] R. v. Hookway, [1999] Crim. L.R. 750 (A.C.); R. v. Clare and Peach, [1995] 2 Cr. App. R. 333 at 335-38; R. v. Clarke, [1995] 2 Cr. App. R. 425 at 429-31; R. v. Stockwell, [1993] 97 Cr. App. R. 260 at 261-66. *See* Ruth Costigan, *Identification from CCTV: the risk of injustice*, CRIM L.R. 591, 591-605 (2007).

accused.[300] With the massive expansion in the number of images available from publicly funded CCTV schemes, along with the proliferation of private security systems and mobile recording devices, English courts have maintained their generally liberal approach to the admission of images and opinions based on images.[301] Two leading cases indicate the receptiveness to image comparison evidence.

In *Attorney-General's Reference No 2 of 2002*, the Court of Appeal confirmed four circumstances in which photographic comparisons are acceptable.[302] The two of immediate interest are where the remote witness (often an investigator) spends time viewing and analysing images "thereby acquiring special knowledge [as an ad hoc expert] which the jury does not have" and "a suitably qualified expert with facial mapping skills can give opinion evidence of identification based on a comparison between images."[303] In both cases, the images should be available to the jury and the admissibility 'subject to appropriate directions in summing up'.[304] Considering the admissibility of a "sufficiently qualified expert" in *R. v. Atkins*, the Court of Appeal confirmed that his evidence was admissible provided limitations were made clear to the jury.[305] The Court explained that there was no rule against positive identification (i.e. individualization), though the absence of statistical information about the frequency or interrelatedness of facial features (i.e., some kind of database) ought to be disclosed.[306] General methodological critiques and frailties with techniques employed by the analyst were matters for weight at the trial.[307]

In the decades since it first appeared in courts, facial mapping in England has largely abandoned any pretensions to mathematical precision and measurement (i.e., anthropometrics).[308] Witnesses now tend to testify in terms of general morphology and similarities. While courts do not proscribe individualization, the witnesses themselves tend to prefer the use of scales that facilitate the provision of qualified opinions derived from subjective impressions of the strength of the evidence (*see* Figure 3 and Table 1).[309] Such opinions are routinely admitted even though, as the Court in *Atkins* recognized, they do "not have a scientific basis."[310]

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[300] *See Hookway*, [1999] Crim. L.R. 750.

[301] Gary Edmond, *Just truth? Carefully applying history, philosophy and sociology of science to the forensic use of CCTV images*, 44 Studies in the History and Philosophy of Biological and Biomedical Sciences (2013) 80-91. This may be technologically-driven. The sheer abundance of images seems to demand judicial consideration. *See, e.g.*, BENJAMIN J. GOOLD, CCTV. AND POLICING: PUBLIC AREA SURVEILLANCE AND POLICE PRACTICES IN BRITAIN (Oxford Univ. Press ed., 2004).

[302] Attorney-General's Reference No 2 of 2002, [2002] EWCA (Crim) 2373, [9]-[12] (Eng.).

[303] *Id.* at [19].

[304] *See also* R. v. Abnett, [2006] EWCA (Crim) 3320, [14], [20] (Eng.). In the nineteenth century English judges had been reluctant to allow investigators to express opinions based on knowledge/experience gained during the course of an investigation; *See also* R. v. Crouch, (1850) 4 Cox C.C. 163 (H.C.) 164.

[305] R. v. Atkins, [2009] EWCA (Crim) 1876, [31] (Eng.).

[306] Use of such scales is difficult to reconcile with the criticism of the misuse of statistics in R. v. Clark, [2003] EWCA (Crim) 1020, [174]-[175]. Reliance on warnings was also a feature of permissive responses to the use of images for the purposes of identification. *See e.g.*, R. v. Dodson, [1984] 1 W.L.R. 971 at 979 (Eng.); R. v. Downey, [1995] 1 Cr. App. R. 547 at 556 (Eng.).

[307] Gary Edmond et al., *Atkins v. The Emperor: The "Cautious" Use of Unreliable "Expert" Opinion*, 14 Int'l Journal of Evidence & Proof 146, 148 (2010).

[308] *See* COMPUTER-AIDED FORENSIC FACIAL COMPARISON (Martin Paul Evison et al. eds., 2009).

[309] These are crude attempts to mimic the likelihood ratios associated with DNA results.

[310] R. v. Atkins, [2009] EWCA (Crim) 1876, [20]; *see* Michael C. Bromby, *At Face Value?*, 2003 NEW L.J. EXPERT WITNESS SUPPLEMENT 301, 302, *available at* http://ssrn.com/abstract=1562655 (discussing the use of facial mapping and CCTV. image analysis for identification).

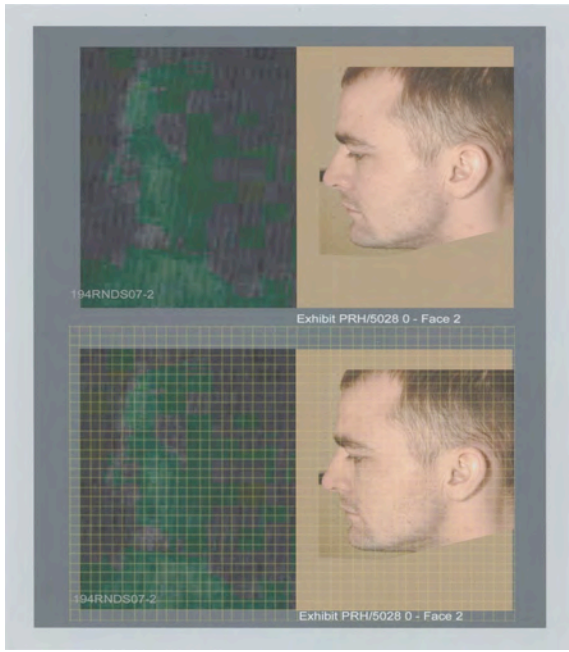


Figure 3: Single image from the crime scene in *R. v. Atkins* (top left). One of the accused (top right). Same images with grids reproduced below.[311]

Level	Description
0	Lends no support
1	Lends limited support
2	Lends moderate support
3	Lends support
4	Lends strong support
5	Lends powerful support

Table 1: "Expert's" assessment of the probative value of the image from *Atkins* in terms of identity (taken from expert's report).[312]

There has been some controversy around facial mapping evidence in England. In this regard, the response to the opinions of one facial mapping witness (Harrow) are suggestive.[313] After many appearances, Harrow came to be seen as 'an expert who over-

[311] The left images in Figure 3 contain the single image retrieved from a security camera system after a home invasion after enhancement. The image on the right is of one of the Atkins brothers. Photographs courtesy of Joe Stone.

[312] R. v. Atkins, [2009] EWCA (Crim) 1876, [8] (this is an attempt to mimic a Bayesian approach to the provision of evidence with no underlying research support).

[313] *Id.* at [12].

stepped the mark' and whose reliability "appeared seriously questionable."[314] Rather than consider Harrow's mistakes as exposing or exemplifying a wider range of problems with facial mapping evidence, the lack of a research base and absence of standardized techniques, as Justice Mitting did in *R. v. Gray*, most courts have preferred to characterize Harrow as a "bad apple", thereby restricting *Gray* to its particular facts.[315] *Atkins* explicitly exemplifies this tendency.[316]

Much of the image comparison evidence, apart from opinions expressed by investigating police officers, is supplied by (or outsourced to) independent consultants (rather than state-employed forensic scientists).[317] Experience with facial mapping indicates how judges may be implicated in the creation and perpetuation of some forensic "fields" and how those fields may possess little, if any, scientific credibility.[318] Facial mapping, *per se*, does not exist beyond its incarnation in law enforcement and investigative communities.

b. Voice Comparison Evidence

Although it is widely accepted that voice identification using only auditory analysis is an unsatisfactory basis of speaker identification, in *R. v. Robb* the Court of Appeal considered such analysis to be admissible evidence.[319] The Court acknowledged that the great weight of informed opinion, including world leaders in the field, was that such techniques unless verified by acoustic analysis were an unreliable basis of speaker identification.[320] It also observed that respected forensic institutes had rejected the use of auditory analysis without supplementation as a basis of voice identification.[321] Further, the Court noted that the expert in question was part of a very small minority of practitioners who were prepared to testify solely on the basis of auditory analysis, that he had not tested the accuracy of his findings and had published no material that would allow such testing to be conducted.[322] It concluded that his opinion had not been shown to be wrong and had therefore been properly admitted at trial.[323]

In *R. v. Chenia* and *R. v. Flynn*, the Court of Criminal Appeals expressed the need for caution when the witness purporting to identify a voice was an investigating police officer whose interpretation might be contaminated by knowledge of the investigation.[324] Such cases now require careful warnings and where possible recordings should be made available so the jury can undertake its own comparison.

It is notable that the Court of Appeal of Northern Ireland, when called upon to consider the admissibility of voice comparison evidence, declined to follow the casual

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[314] *Id.* at [16].

[315] R. v. Gray, [2003] EWCA (Crim) 1001, [16] (Eng.).

[316] R. v. Atkins, [2009] EWCA (Crim) 1876, [16]–[18].

[317] This may, in part, be a risk management strategy.

[318] On co-production, *see* SHEILA JASANOFF, SCIENCE AT THE BAR: LAW, SCIENCE, AND TECHNOLOGY IN AMERICA (1995).

[319] R. v. Robb, [1991] 93 Cr. App. R. 161 at 166-68 (Eng.). *See* David C. Ormerod, *Sounding Out Expert Voice Identification Evidence*, CRIM. L.R. 771 (2002) (UK); David C. Ormerod, *Sounds Familiar? Voice Identification Evidence*, CRIM. L.R. 595, 595-98 (2001) (UK).

[320] *Robb*, 93 Cr. App. R. at 164-166.

[321] *See id.* at 164-166.

[322] *Id.* at 164-66.

[323] *See id.* at 167.

[324] R. v. Flynn, [2008] EWCA (Crim) 970, [53] (Eng.); R. v. Chenia, [2002] EWCA (Crim) 2345, [100], [102] (Eng.). Note that such concerns do not ordinarily arise in relation to other types of comparison evidence such as images.

approach adopted in *Robb*.[325] In *R. v. O'Doherty*, it declared that in light of the state of scientific knowledge at the time, no prosecution ought to proceed in Northern Ireland in which the Crown proposed to rely predominantly on auditory analysis of voice recordings.[326]

C. Canada: Admissibility Standards, Jurisprudence, and Practice

Canada is a federal system, divided into ten provinces and three territories. The federal government has exclusive jurisdiction over criminal law, but courts administration, policing and some prisons are provided provincially. Federal and provincial evidence acts establish some rules of admissibility, however common law is the leading source of evidence law.[327] Though originating in England, the common law of Canada has departed from contemporary English law in some important respects. In particular, the Supreme Court of Canada has adopted a principles-based approach to evidence, seeking to articulate and apply a uniform set of values to guide trial judges when deciding the admissibility of evidence.[328] Principles such as necessity, reliability and the right to a fair trial have been judicially defined and are balanced against one another at the time of the admissibility decision.[329] In adopting this approach, the Court has moved away from the traditional rigid approach based on categories of admissibility. In many areas, this has led to a more liberal (i.e., inclusive) admissibility standard, although it is sometimes suggested that expert evidence has become more difficult to tender under the principles-based approach.[330]

Since 1982, the Canadian constitution has incorporated a Charter of Rights and Freedoms.[331] The Charter has had an enormous impact on criminal procedure and evidence, and particularly on investigative practices. Rights protected under the Charter include a right to be free from unreasonable search and seizure, a right to a fair and public trial, and a right to legal counsel.[332] Three decades of jurisprudence has given texture and limits to these rights, and set out the manner in which courts must safeguard Charter rights in their procedures. The focus on Charter protections has outweighed the articulation of other evidentiary principles in relation to forensic science and medicine, and the vast majority of defense challenges to the admissibility of forensic evidence are predicated on an alleged Charter violation such as a warrantless search, illegal arrest or denial of counsel. In light of this emphasis, Canadian trial practice on such issues as the reliability of forensic evidence has at times become an afterthought to the procedural protections afforded by the Charter. The seeming reluctance of trial counsel to challenge the reliability of expert opinion evidence is particularly striking given recent decisions from the

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[325] Although part of the United Kingdom, Northern Ireland is a distinct common law legal jurisdiction, although its criminal procedure is, in many respects, similar to that in England and Wales.

[326] R. v. O'Doherty, [2003] Cr. App. R. 5, 91 (N. Ir.).

[327] Gary Edmond & Kent Roach, *A Contextual Approach to the Admissibility of the State's Forensic Science and Medical Evidence*, 61 U. TORONTO L.J. 343, 346-47 (2011).

[328] *Id.*

[329] *Id.* at 392.

[330] ALAN D. GOLD, EXPERT EVIDENCE IN CRIMINAL LAW: THE SCIENTIFIC APPROACH 1-2 (2d ed. 2010). *See also* Edmond & Roach, *supra* note 327, at 375. The leading textbook on Canadian evidence law is ALAN W. BRYANT, SIDNEY N. LEDERMAN & MICHELLE K. FUERST, THE LAW OF EVIDENCE IN CANADA (3d ed. 2009) (the introduction to this text provides a very helpful review of the trends within Canadian evidence law, elaborating on the principles/rules distinction described in the text accompanying this footnote).

[331] Canadian Charter of Rights and Freedoms, Part I of the Constitution Act, 1982, *being* Schedule B to the Canada Act, 1982, c. 11, § 1 (U.K.).

[332] Canadian Charter of Rights and Freedoms, s. 8, s. 10, s. 11, Part 1 of the Constitution Act, 1982, *being* Schedule B to the Canada Act, 1982, c. 11, s. 8-10, 11. (U.K.).

Supreme Court of Canada endorsing *Daubert* and its criteria, and a body of critical work that has emerged from high profile wrongful convictions.[333]

The leading Canadian case on the admissibility of expert evidence is *R. v. Mohan*.[334] A unanimous Court moved away from the relevance and helpfulness standard in place in English law, holding that:

Admission of expert evidence depends on the application of the following criteria:

(a) relevance;
(b) necessity in assisting the trier of fact;
(c) the absence of any exclusionary rule; [and]
(d) a properly qualified expert.[335]

On behalf of the Court, Justice Sopinka explained that relevance is a broad inquiry, encompassing logical as well as legal relevance, and requiring a trial judge to assess the reliability of the putative evidence against its costs, including the risk of distortion or over-valuation.[336] Necessity was described as a standard that is higher than the "helpfulness" requirement set out in English precedent, but that should not be judged "by too strict a standard."[337] However, novel scientific evidence (which seems to mean evidence that has not previously been accepted in a court, but may extend to new applications of established techniques) must be "essential" in the sense that a jury will be unable to come to the correct decision without the evidence, in order to be admissible.[338] The requirement that another exclusionary rule must not apply is consistent with rules applied elsewhere in the Commonwealth.[339] The qualification requirement was described by Sopinka J as a need for the expert to demonstrate "special or peculiar knowledge [acquired] through study or experience."[340] While the qualification requirement was initially relatively lax, and arguably remains so in some fields, the identification of wrongful convictions attributable to poor quality expert evidence has led to some instances of a more rigorous assessment of qualifications. Trial judges are increasingly being encouraged by appeal courts to identify and enforce the boundaries of a witnesses' expertise.[341]

Rules prohibiting an expert from testifying on the ultimate issue and requiring that expert evidence go beyond matters that are common knowledge have become less important over time, though they retain some formal status and are occasionally

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[333] *See, e.g.*, STEPHEN T. GOUDGE, INQUIRY INTO PEDIATRIC FORENSIC PATHOLOGY IN ONTARIO: REPORT 514 (2008), *available at* http://www.attorneygeneral.jus.gov.on.ca/inquiries/goudge/report/v3_en_pdf/Vol_3_Eng.pdf; PATRICK J. LESAGE, REPORT OF THE COMMISSION OF INQUIRY INTO CERTAIN ASPECTS OF THE TRIAL AND CONVICTION OF JAMES DRISKELL 172-73 (2007), *available at* http://www.driskellinquiry.ca/pdf/final_report_jan2007.pdf; FRED KAUFMAN, REPORT OF THE KAUFMAN COMMISSION ON PROCEEDINGS INVOLVING GUY PAUL MORIN 12-13 (1998), *available at* http://www.attorneygeneral.jus.gov.on.ca/english/about/pubs/morin/morin_ch1.pdf.

[334] R. v. Mohan, [1994] 2 S.C.R. 9, para. 32 (Can.).

[335] *Id.* at paras. 17-21.

[336] *Id.* at paras. 22-23.

[337] *Mohan*, [1994] 2 S.C.R. 9, para. 26. *See also* R. v. D.D., 2000 SCC 43, para. 21 (Can.); R. v. J.-L.J., 2000 SCC 51, para. 56 (Can.).

[338] *Mohan*, [1994] 2 S.C.R. 9, para. 32.

[339] *See, e.g.*, R. v. Morin, [1988] 2 S.C.R 345, paras. 54-64 (Can.).

[340] *Mohan*, [1994] 2 S.C.R. 9, para. 31.

[341] *See* R. v. Abbey, 2009 ONCA 624, paras. 62-64 (Ont. C.A.); GOUDGE, *supra* note 333, at 457; Emma Cunliffe, *Without Fear or Favour? Trends and Possibilities in the Canadian approach to Human Behaviour Evidence*, 10 INT'L J. EVIDENCE & PROOF 280 (2006) (a longer discussion of the Canadian admissibility test and its application).

invoked.[342] Canadian judges have been reluctant to admit expert evidence on matters they regard as being common knowledge, such as the inadequacies of human memory in eyewitness identification.[343] The Supreme Court of Canada suggested for a time that expert evidence is admissible regardless of the extent to which the facts underlying the opinion have been proven, but that the jury should be instructed to consider the extent of proof in deciding what weight to give the evidence.[344] More recent cases seem to have backed away from this laissez-faire approach, holding instead that a lack of admissible proof of underlying facts can undermine the admissibility of the opinion.[345] The latter approach is certainly more consistent with the cost/benefit analysis adopted by the Court in *Mohan*.

During the last decade the Supreme Court has formally supplemented the *Mohan* approach with a more explicit recognition of the need for evidence of reliability.[346] Conspicuously influenced by *Daubert*, this standard is sometimes characterized as "threshold reliability."[347] In *J-LJ*, *DD* and most recently *Trochym*, the Court referred approvingly to *Daubert* and/or endorsed the reliability criteria.[348] Subservient to *Mohan*, *Daubert*-style criteria have not been strictly applied, especially to types of evidence that have long been admitted or are not easily assessed in terms of validation and proficiency testing.[349]

Despite the relatively large number of Supreme Court of Canada decisions on the admissibility of expert evidence, much expert evidence (particularly evidence tendered by the Crown) is admitted with, at best, a perfunctory admissibility enquiry.[350] A study of the courts of British Columbia by Cunliffe suggests that when admissibility is contested, trial judges most often admit the expert testimony and leave reliability as an issue of weight to be determined by the tribunal of fact. Expert evidence is rarely excluded on the basis of unreliability, particularly when that evidence relates to what is considered as a routine forensic procedure. Police officers and other investigative professionals are at times qualified by trial judges as expert witnesses on the basis of relatively slight experience, or to testify about the results of tests developed and performed in the context of a specific case.[351] At other times these opinions are admitted as non-expert opinion evidence.[352]

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[342] *See* R. v. Marquard, [1993] 4 S.C.R. 223 (trial judge did not commit error of law when expert was allowed to testify outside area of expertise); R. v. R(D.), [1996] 2 S.C.R. 291 (evidence was admissible but trial judge must give reasons for reaching conclusions or a new trial will be ordered); R. v. Burns, [1994] 1 S.C.R. 656 (expert testimony admissible to explain human behavior).

[343] *Compare* R. v. McIntosh (1997), 35 O.R. 3d 97, para. 25-26 (Can. Ont. C.A.); *and* R. v. Myrie (2003), 57 W.C.B. 2d 72 (Can. Ont. Sup. Ct. J.), *and* Lee Stuesser, *Experts on Eyewitness Identification: I Just Don't See It*, 31 MAN. L.J. 543 (2006) (A representative discussion), *with* PETER CORY, THE INQUIRY REGARDING THOMAS SOPHONOW: THE INVESTIGATION, PROSECUTION, AND CONSIDERATION OF ENTITLEMENT TO COMPENSATION (2001) (Man.), *available at* http://www.gov.mb.ca/justice/publications/sophonow/toc.html.

[344] R. v. Abbey, [1982] 2 S.C.R. 24, para. 52 (Can.).

[345] R. v. Lavallee, [1990] 1 S.C.R. 852 (Can.); R. v. Abbey, 2009 ONCA 624, paras. 147-49 (Can. Ont. C.A.).

[346] *See, e.g.*, R. v. Trochym, 2007 SCC 6, para. 33 (Can.); R. v. D.D., 2000 SCC 43, para. 57 (Can.); R. v. J-L.J., 2000 SCC 51, paras. 31, 33 (Can.).

[347] *Trochym*, 2007 SCC 6 at para. 33.

[348] *Id.* at paras. 36, 139-40; *D.D.*, 2000 SCC 43 at paras. 36, 57; *J.-L.J.*, 2000 SCC 51 at paras. 33, 59.

[349] *Compare* R. v. Abbey, 2009 ONCA 624 para. 48 (Can. Ont. C.A.), *with* Gary Edmond & Kent Roach, *A Contextual Approach to the Admissibility of the State's Forensic Science and Medical Evidence*, 61 U. TORONTO L.J. 343, 344 (2011).

[350] *See* Att'y Gen. of Can. v. D.O.L., [1993] 4 S.C.R. 419, para. 52 (Can.) (declaring a trend toward inclusion), *quoted in* R. v. Nikolovski, [1996] 3 S.C.R. 1197, para 18 (Can.); R. v. Graat, [1982] 2 S.C.R. 819, para. 48 (Can.).

[351] R. v. Nikitin (2003), 176 C.C.C. 3d 225, paras. 6-7 (Can. Ont. C.A.); R. v. Collins (2001), 160 C.C.C. 3d 85, para. 9 (Can. Ont. C.A.); R. v. Brooks (1998), 129 C.C.C. 3d 227, paras. 7-9 (Can. Ont. C.A.), *rev'd*, 2000 SCC 11 (Can.); R. v. Laverty (1979), 47 C.C.C. 2d 60, para. 3 (Can. Ont. C.A.).

These trends in trial courts suggest a lack of engagement with the recommendations made by commissions of inquiry into wrongful convictions. Successive commissioners have recommended closer trial scrutiny of investigative practices associated with forensic science: most recently in the Goudge Inquiry into child homicide cases.[353] In many of these inquiries forensic science or medicine was identified as a source of error that positively, and sometimes systematically, contributed to wrongful convictions.[354]

The leading provider of forensic services is an arm of the Royal Canadian Mounted Police (RCMP), and there is no independent forensic science institute like those that currently exist in some parts of Australia (e.g., South Australia) and once existed in England—before the demise of the Forensic Science Service (FSS). Only one published judgment cites the NRC report (without engaging with it substance), and the number of challenges to the reliability of forensic science and medicine evidence does not seem to have increased since its publication. Legal aid funding is a particular concern, in this regard. As is true in other jurisdictions, the amount of funding available to legally aided defendants is inadequate and has been declining over time. This presents a considerable barrier to contested trials of any sort, preventing robust analysis of Crown (or state adduced) forensic science and medicine evidence.[355] Defense experts are out of the question in many cases.

In the vast majority of criminal trials in Canada a trial judge, rather than a jury, acts as the tribunal of fact.

1. Latent Fingerprint Evidence

Canada came relatively late to latent fingerprint evidence, although the RCMP began using latent fingerprint identification as an investigative technique in the early twentieth century. The first two reported decisions on the admissibility of fingerprint evidence were both decided in 1934, and in both cases the evidence was excluded.[356] In *R. v. Wiswell*, the Nova Scotia Court of Appeal suggested that the knowledge and practices underlying fingerprint identification had not been sufficiently proven to admit the evidence.[357] In *R. v. De'Georgio & Servello*, the Crown argued that a fingerprint identification was a question of fact rather than of expert opinion.[358] The judge treated the officer's evidence as potential expert testimony, and excluded it on the basis that the officer had given no account of how he reached his conclusion.[359]

The first reported case in which fingerprint evidence was admitted was *R. v. Buckingham & Vickers*.[360] Justice Robertson distinguished the earlier cases, finding that the police officers who testified to a match on this occasion had given "a very complete

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[352] R. v. Graat, [1982] 2 S.C.R. 819, para. 10 (Can.); R. v. Walizadah, 2007 ONCA 528, para. 36 (Can. Ont. C.A.); R. v. Ilina, 2003 MBCA 20, para. 64 (Can. Man. C.A.).

[353] STEPHEN T. GOUDGE, INQUIRY INTO PEDIATRIC FORENSIC PATHOLOGY IN ONTARIO: REPORT 420 (2008).

[354] *E.g.*, LESAGE, *supra* note 333; ANTONIO LAMER, THE LAMER COMMISSION OF INQUIRY PERTAINING TO THE CASES OF: RONALD DALTON, GREGORY PARSONS AND RANDY DRUKEN (2006); KAUFMAN, *supra* note 333.

[355] *See, e.g.*, MELINA BUCKLEY, MOVING FORWARD ON LEGAL AID, RESEARCH ON NEEDS AND INNOVATIVE APPROACHES (2010); AB CURRIE, THE UNMET NEED FOR CRIMINAL LEGAL AID: A SUMMARY OF RESEARCH RESULTS (2003).

[356] R. v. Wiswell, [1935] 1 D.L.R. 624, para. 9 (Can. N.S. Sup. Ct.); R. v. De'Georgio, [1934] 3 W.W.R. 374, para. 18 (Can. B.C. Cnty. Ct.).

[357] R. v. Wiswell, [1935] 1 D.L.R. 624, para. 9.

[358] R. v. De'Georgio, [1934] 3 W.W.R. 374, para. 7.

[359] *Id.* at paras. 7, 19.

[360] R. v. Buckingham (1943), [1946] 1 W.W.R. 425, paras. 7, 22 (Can. B.C. Sup. Ct.).

and adequate explanation as to why they came to the conclusion that these fingerprints are the same as those of the accused."[361] There was no other evidence linking the accused to the crime in this case, and the accused was ultimately acquitted by the jury.[362] *Pelletier. v. Le Roi* was the first Court of Appeal decision to confirm the admissibility of latent fingerprint evidence.[363] The Quebec court affirmed the reliability and universal admissibility of fingerprint evidence, effectively approving this evidence for use in criminal trials thereafter.[364] By 1988, the Supreme Court of Canada felt sufficiently confident in latent fingerprint comparison to describe the technique as 'an invaluable tool of criminal investigation . . . because it is virtually infallible.'[365]

There appears to be no reported case in which fingerprint evidence has been excluded since *Pelletier. v. Le Roi* affirmed admission in 1952.[366] From time to time, judges acknowledge that experts must exercise judgment in declaring a match,[367] or provide a critical assessment of the inferences that may or may not be drawn from the presence of matched fingerprints at a crime scene.[368] In other cases, judges declare that fingerprinting is so widely accepted that it can be admitted with little or no screening.[369]

Canada has no investigative or evidentiary requirements of a minimum number of similar points to declare a match.[370] Experts tend nonetheless to testify to the number of similar features identified, at times using visual aids to demonstrate them to the tribunal of fact. Experts usually testify to a "match" between the accused's fingerprints and those found at a scene. The advent of *Mohan*, with its emphasis on case-by-case determinations of the admissibility of expert evidence, does not seem to have affected fingerprint evidence.[371] Effectively, this and the other familiar forms of forensic evidence considered in this article seem to have been grandfathered out of the *Mohan-Daubert* framework.[372]

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[361] *Id.* at para. 22.

[362] *Id.* at paras. 9, 24.

[363] Pelletier. v. R., [1952] B.R. 633 (Can. Que. K.B.).

[364] *Id.* at para. 21.

[365] R. v. Beare (1987), [1988] 2 S.C.R. 387, para. 21 (Can.).

[366] Pelletier. v. R., [1952] B.R. 633 at para. 21 (Can. Que. K.B.).

[367] R. v. Murrin (1999), 181 D.L.R. 4th 320, para. 74 (Can. B.C. Sup. Ct.); R. v. Borden (1993), 124 N.S.R. 2d 163, para. 147 (Can. N.S. C.A.).

[368] *See* R. v. Mars (2006), 206 O.A.C. 387, paras. 19-21 (Can. Ont. C.A.).

[369] R. v. Johnston (1992), 69 C.C.C. 3d 395, para. 92 (Can. Ont. Ct. J.).

[370] Jeff Wise, *Under the Microscope: Legal Challenges to Fingerprints and DNA as Methods of Forensic Identification*, 18 INT'L REV. L., COMPUTERS & TECH. 425, 427 (2004).

[371] R. v. Mohan, [1994] 2 S.C.R. 9 (Can.).

[372] Wise, *supra* note 371, at 427.

2. DNA Evidence

The leading Canadian case on the admissibility of DNA evidence is R. v. Terceira.[373] In that case, the Court confirmed that the Mohan test applies to DNA evidence, and defined a "match" as a "failure to exclude a suspect's DNA."[374] The Terceira court regarded reliability as the touchstone of admissibility for a novel technique (as RFLP analysis was in 1991).[375] Evidence on the statistical probability of a random match was also accepted, although the Court held that the admissibility of this evidence should be considered on a case-by-case basis.[376] While probability evidence was often ruled inadmissible in the 1990s, evidence of a match was invariably admitted from the first cases. Probability estimates are now routinely admitted.

Early Canadian case law on the admissibility of DNA relied heavily on U.S. judges' conclusions regarding the reliability of DNA matching and the appropriateness of forensic techniques adopted in crime investigation laboratories.[377] As new techniques were introduced (e.g. PCR and mtDNA), this reliance on U.S. precedent has persisted. Questions about the applicability of probability-based statistics to indigenous populations and ethnic minorities have been recurrent.[378] In one Alberta case, a defense expert who testified about the shortcomings of the statistical evidence given by prosecution witnesses, partly in reliance on the first NRC report,[379] was found to have given irrelevant and unreliable evidence by a judge who ultimately relied on the Crown expert's evidence that a match had been found.[380] However, in the first decision on the admissibility of mitochondrial DNA evidence, the Supreme Court of British Columbia ordered that proficiency tests be disclosed to the accused, and carefully considered evidence regarding both proficiency and validity testing.[381] In keeping with earlier decisions, Henderson J concluded that the risk of contamination occurring in a particular case is a matter for the jury which should not preclude admission of the evidence.[382]

The openness towards DNA evidence that has been shown by Canadian courts is not restricted to human DNA. Forensic scientists have been permitted to testify that a comparison of the phylogenetic profile of HIV made it highly likely that an accused infected 11 victims with HIV.[383] Phylogenetic comparisons were also admitted in an effort to establish that HIV contaminated blood was used in a coagulant product administered to hemophiliacs in the mid 1980s, although the application of the technique in that case was ultimately found unreliable by the trial judge.[384] In another case, cat hairs found on a jacket similar to one the accused had been known to wear were alleged to match the DNA

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[373] R. v. Terceira (1998), 38 O.R. 3d 175, para. 12 (Can. Ont. C.A.), *aff'd*, [1999] 3 S.C.R. 866, paras. 2-3 (Can.).

[374] *Id.* at paras. 15, 19.

[375] *Id.* at para. 29.

[376] *Id.* at para. 43.

[377] R. v. Lafferty, [1993] 4 W.W.R. 74, para. 44 (Can. N.W.T. Sup. Ct.); R. v. Baptiste, 1991 CarswellBC 1277 (Can. B.C. Sup. Ct.) (WL); R. v. Bourguignon, [1991] O.J. No. 2670 (Can. Ont. Ct. J.) (QL); R. v. Bourguignon, [1990] O.J. No. 1205 (Can. Ont. Provincial Ct.) (QL).

[378] R. v. Lafferty, [1993] 4 W.W.R. 74, para. 44; R. v. Baptiste, 1991 CarswellBC 1277, paras. 54-56; R. v. Bourguignon, [1991] O.J. No. 2670.

[379] NAT'L RESEARCH COUNCIL, DNA TECHNOLOGY IN FORENSIC SCIENCE (1992).

[380] R. v. Love, [1994] A.W.L.D. 761, paras. 162-167 (Can. Alta. Ct. Q.B.) (discussing that probability statistics given by Crown experts ranged from 1 in 470 billion to 1 in 1.19 trillion), *aff'd*, 174 A.R. 360 (Can. Alta. C.A.).

[381] R. v. Murrin (1999), 181 D.L.R. 4th 320, paras. 76, 108 (Can. B.C. Sup. Ct.).

[382] R. v. Murrin (1999), 181 D.L.R. 4th 320; *see also* R. v. G.J.T. (2001), 200 Nfld. & P.E.I.R. 81 (Can. Nfld. Sup. Ct.) (discussing the Profiler Plus test).

[383] R. v. Aziga, [2008] O.J. No. 5131, paras. 24-26 (Can. Ont. Super. Ct. J.) (QL).

[384] R. v. Armour Pharmaceutical Co. (2007), 226 C.C.C. 3d 438, para. 94 (Can. Ont. Super. Ct. J.).

of the victim's cat.[385] In response to defense criticisms of the number and homogeneity of cats included in the ad hoc sample of local cat DNA assembled for this case, the forensic scientist testified, "We used a lot of loci instead of a lot of cats."[386] The evidence was admitted, and its admissibility was upheld on appeal.[387]

There seem to be no Canadian cases in which DNA evidence was wholly excluded from trial.

3. Bite Marks

In Canada, bite mark evidence has been associated with exculpation in high profile cases. Two important examples are *R. v. Unger*,[388] in which a forensic odontologist testified that bite marks on the victim were not made by the accused; and *R. v. Reynolds*, where a forensic pathologist opined that wounds were made by scissors leading to murder charges being laid against the victim's mother.[389] Unger is now considered to have been wrongly convicted, and Reynolds is also widely regarded as innocent of the charges that were laid against her.[390] In *Reynolds*, a forensic odontologist concluded that the puncture wounds were made by a dog.[391] Forensic odontology seems to be one of relatively few fields in which defense experts are occasionally called in Canada.

A review of cases in which bite mark evidence is admitted suggests that lawyers and judges allow bite mark specialists wide latitude when testifying. For instance, courts have permitted bite mark witnesses to testify about the force required to leave a particular mark;[392] about the psychological state experienced by a person when biting;[393] and about whether an injury to a victim's head was caused by a boot.[394] In some of these cases, the court suggested that little weight should be given to the opinion—nonetheless, the testimony was permitted.

A rare example of a more critical assessment of bite mark evidence is *R. v. Taillefer; R. v. Duguay*.[395] In this case, the expert testified that a bite mark was consistent "beyond reasonable doubt" with the accused's bite pattern.[396] The expert had previously given an opinion that the same mark was caused by a different suspect.[397] The Supreme Court of Canada upheld the accused's appeal from conviction on the basis of non-disclosure of the earlier opinion.[398] While discussing the relevance of the inconsistent opinion to the expert's credibility, the Court did not comment on the reliability arguments

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[385] R. v. Beamish (1999), 177 Nfld. & P.E.I.R. 265, para. 9 (Can. P.E.I. Sup. Ct.).

[386] *Id.*at paras. 9-10.

[387] *Id.* at para. 19.

[388] R. v. Unger (1993), 83 C.C.C. 3d 228, para. 9 (Can. Man. C.A.).

[389] GOUDGE, *supra* note 354, at 23 (Crown withdrew the case before proceeding to verdict).

[390] *See* GOUDGE, *supra* note 354, at 25; Gabrielle Giroday, *Unger's Murder Conviction Overturned*, WINNIPEG FREE PRESS (Mar. 11, 2009, 4:54 PM), *available at* http://www.winnipegfreepress.com/breakingnews/Conviction-of-Unger-overturned-41085982.html; *Kyle Unger Acquitted of 1990 Killing*, CBC NEWS (Oct. 23, 2009, 9:38 PM), http://www.cbc.ca/news/canada/manitoba/story/2009/10/23/mb-unger-acquitted-manitoba.html.

[391] GOUDGE, *supra* note 354, at 23.

[392] R. v. Ho (1999), 141 C.C.C. 3d 270, para. 69 (Can. Ont. C.A.).

[393] R. v. J.A.A., 2011 SCC 17 at para. 31 (Can.).

[394] R. v. Smith, 2005 BCSC 1624, paras. 76-79 (Can. B.C. Sup. Ct.).

[395] R. v. Taillefer, 2003 SCC 70 (Can.).

[396] *Id.* at para. 36.

[397] *Id.*

[398] *Id.* at paras. 134-135.

raised by the accused.[399] The Court did not suggest that the patent reliability concerns in this case mandated exclusion of the evidence.[400]

4. Incriminating Images and Voice Recordings

a. Opinions about Images

Expert testimony about images is rarely offered in Canada for two reasons. First, in *R. v. Nikolovski*, the Supreme Court of Canada held that a tribunal of fact may reach its own conclusion about identification by comparing images of a person of interest with the accused person, even in cases where no other evidence links the accused with the crime.[401] Trial judges are exhorted to emphasize the care required to reach such a verdict, but the Mohan criteria will not condition the admissibility of footage or photographic evidence for this purpose. Secondly, Canadian courts routinely permit a witness who knows the accused to testify that he or she can identify the accused as the person depicted in video or photographic images.[402] Often, the witness called by the Crown for this purpose is a police or probationary officer, or prison guard. Nonetheless, and perhaps reassuringly, the case law includes several examples of those accused being acquitted in circumstances where images and supplementary identification evidence are the only evidence presented to establish identity.[403] However, while judges frequently rehearse the general dangers of identification evidence, they never disclose any familiarity with technical literature on the topic, nor offer an analysis of the special issues associated with image identification beyond occasional references to image quality.[404]

We have identified only three reported decisions in which expert testimony was admitted to assist the court to interpret video imagery.[405] In R. v. Brown, the defense led expert evidence from an anthropologist (relying on facial morphology, photo-anthropometry and video superimposition) to support its claim that the accused were not the individuals shown in a video linked to the charged murder.[406] The trial judge allowed the evidence over the Crown's objections, finding that it was likely respectable within its field and that any frailties in the expert's methodologies could be fully canvassed in cross-examination.[407] In R. v. Eakin, the Manitoba Court of Queen's Bench admitted expert evidence proffered by the Crown to show that the movements captured on a video were consistent with the accused punching the alleged victim, and inconsistent with the

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[399] *Id.* at paras. 46, 54, 105.

[400] *Id.*

[401] R. v. Nikolovski, [1996] 3 S.C.R. 1197, para. 23 (Can.).

[402] *E.g.*, R. v. Leaney, [1989] 2 S.C.R. 393, paras. 18, 28 (Can.); R. v. Anderson, 2005 BCSC 1346, para. 25 (Can. B.C.) (summarizing indicia relevant to determining whether a witness is sufficiently familiar with the accused to perform this role).

[403] *See, e.g.*, R. v. Copeland, 2011 ONSC 1568 (Can. Ont.) (holding that a fingerprint "match" was not conclusive proof of identity where there may have been an innocent explanation for its existence); R. v. New, 2010 ABPC 391, paras. 30, 36, 48 (Can. Alta.); R. v. Boersma, 2009 ONCJ 178, paras. 35, 42-43, 48 (Can. Ont.); R. v. Gamble, 2009 SKPC 65, paras. 34-36 (Can. Sask.); R. v. Grewal, 2008 BCPC 211, paras. 41, 63 (Can. B.C.); R. v. D.A.H., 2006 BCPC 400, paras. 60, 62 (Can. B.C.); R. v. Chohan, 2006 BCPC 421, paras. 23-24, 28 (Can. B.C.); R. v. Martin, 2005 NSPC 32, paras. 29-30 (Can. N.S.); R. v. Moyou, 2003 BCPC 63 (Can. B.C.); R. v. Gibbons, 2003 ABPC 114, paras. 10, 24-25 (Can. Alta.); R. v. Griffith, 1997 CarswellBC 2819, paras. 20, 22 (Can. B.C. S.C.). *But see* R. v. R.H., 2010 ONCA 704, paras. 6-7, 9-10 (Can. Ont.) (holding that the trial judge's reliance on videotape evidence was not error).

[404] *See* R. v. Lindgren, 2010 BCPC 283, para. 9 (Can. B.C.); R. v. Elkins, 2007 BCSC 929, para. 21 (Can. B.C.); R. v. Aitken 2012 BCCA 134 (Can. B.C.).

[405] R. v. Eakin, 2000 MBQB 107, para. 5 (Can. Man.); R. v. Brown, 1999 CarswellOnt 4703, paras. 1, 4 (Can. Ont. Sup. Ct. J.) (WL).

[406] *Brown*, 1999 CarswellOnt at paras. 1, 4.

[407] *Id.* at para. 8.

accused's version of events.[408] In *R. v. Aitken* the British Columbia Court of Appeal upheld admission of the analysis of video by a podiatrist (so-called gait analysis) to help identify the accused.[409]

b. Opinions about Voices (and Sounds)

Voice identification evidence is routinely admitted in Canada, almost always via lay witnesses.[410] Courts allow police officers to testify to voice identifications that match intercepted communications based on a few words spoken by an accused person at the time of arrest.[411] This evidence is considered directly admissible as a question of fact, and is expressly not subject to the rules regulating opinion and expert evidence.[412] Accordingly, arguments about the reliability of voice identification go to weight rather than admissibility.[413]

The tribunal of fact is encouraged to consider several aspects of a purported identification before acting on it.[414] The factors set out in the case law regarding jury instructions are effectively indicia of reliability. Because lay identification evidence is directly admissible, the vast majority of challenges to the admissibility of voice identification evidence are made on the basis of alleged Charter violations, without raising reliability.[415] The Canadian receptivity towards lay voice identification does not seem to have been disturbed by two high profile wrongful convictions that relied upon lay voice identification evidence.[416]

Given that lay voice identification is so readily accepted, expert evidence about voice identification is very rarely called. One of the first Canadian cases in which an expert was admitted was *R. v. Medvedew*.[417] The trial judge allowed a trained police officer to testify on the basis of spectrographic analysis that two voices were "the same."[418] Instructions encouraged the jury to provide "a respectful audience,", but also to consider the possibility of error.[419] Unusually, a defense expert was also called in this case.[420] The defense expert was highly critical of the methods used by the Crown expert.[421] The defense also argued that the Crown expert should have tendered the

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[408] *Eakin*, 2000 MBQB at para. 5.

[409] *Aitken* 2012 BCCA 134.

[410] Although the trier of fact, as with images, may make its own interpretation of both the identity of a speaker and of the content or meaning of what was allegedly spoken. *See, e.g.*, R. v. Turpin, 2011 ONCA 193, para. 36 (Can. Ont.).

[411] R. v. Lepage, 2008 BCCA 132, paras. 20, 25 (Can. B.C.); R. v. Parsons (1977), 17 O.R. 2d 465, para. 26 (Can. Ont. C.A.), *aff'd*, Charette v. R., [1980] 1 S.C.R. 785, 786 (Can.).

[412] R. v. Adam, 2006 BCSC 1884, para. 136 (Can. B.C.); R. v. Chan, 2001 BCSC 1180, para. 28 (Can. B.C.); R. v. Williams (1995), 80 O.A.C. 119, para. 18 (Can. Ont. C.A.); *Parsons*, 17 O.R. 2d at para. 18.

[413] *Williams*, 80 O.A.C. at para. 17.

[414] *Adam*, 2006 BCSC at paras. 137-40.

[415] R. v. Ngo, 2003 ABCA 121, para. 13 (Can. Alta.); R. v. Scarpino, [1998] B.C.J. No. 1563, para. 1 (Can. B.C.) (QL); R. v. Rendon, [1997] O.J. No. 5505 (Can. Ont. Sup. Ct. J.) (QL).

[416] R. v. Henry, 2010 BCCA 462, para. 118 (Can. B.C.); R. v. Morin, [1991] O.J. No. 2528, paras. 260-61 (Can. Ont.) (QL); FRED KAUFMAN, REPORT OF THE KAUFMAN COMMISSION ON PROCEEDINGS INVOLVING GUY PAUL MORIN, 405-06, 964-66 (1998).

[417] R. v. Medvedew (1978), 91 D.L.R. 3d 21, paras. 8-10, 25 (Can. Man. C.A.). *See also* R. v. Montani (1974), 26 C.R.N.S. 339, para. 25 (Can. Ont. P.C.).

[418] *Medvedew*, 91 D.L.R. 3d at para. 16.

[419] *Id.* at para. 14.

[420] *Id.* at paras. 17-18.

[421] *Id.* at para. 18.

spectrogram results for the jury's consideration.[422] The trial judge left all of this evidence to the jury, and a majority of the Manitoba Court of Appeal found that he was right to admit the evidence and that there was no error in the instructions provided to the jury.[423] A strong dissent was issued, referring to inadequacies in the Crown case and explaining the controversies then raging about voice identification evidence in the United States.[424] Justice O'Sullivan held that the trial judge should not have qualified the Crown expert without first being satisfied that the technique was scientifically valid.[425] While O'Sullivan JA's dissent has occasionally been favorably mentioned in subsequent cases, it has never formally been adopted by an appeal-level court.

A second dimension to "expert" testimony about voice identification is the use of translators to identify a speaker. At times, courts have been willing to extend the field of expertise (translation) in which a translator is qualified to include expertise in identifying individual voices speaking in the translator's language.[426] However, even in this context, the question of expertise rarely arises because of the readiness with which lay identifications are admitted.

D. Australia: Admissibility Standards, Jurisprudence, and Practice

Australia is also a federal system. The six states and two territories are responsible for the vast majority of criminal laws and prosecutions. There are basically two systems of evidence law operating among the various state, territory and federal jurisdictions.[427] The older, common law system was originally drawn from England and continues to resemble contemporary English practice. The more recent addition is the uniform evidence law (UEL), introduced in 1995 following the coordinated enactment of a series of largely standardized evidence statutes.[428] The common law continues to apply in South Australia, Queensland, Western Australia and the Northern Territory.[429] The Commonwealth (i.e., federal courts), the Australian Capital Territory, New South Wales, Tasmania and Victoria apply the UEL.[430] This slowly expanding second group comprises the most populous states where the majority of commercial and criminal litigation occurs. In general, Australian judges in both systems have developed liberal (or inclusive)

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[422] *Id.* at para. 19.

[423] *Id.* at paras. 20-21.

[424] *Id.* at paras. 41-55.

[425] *Id.* at para. 55.

[426] *E.g.*, R. v. Hoang, 2000 ABPC 55, paras. 9, 46 (Can. Alta.). *But see* R. v. Ngo, 2003 ABCA 121, paras. 13, 36 (Can. Alta.) (excluding voice evidence on the basis of a Charter breach).

[427] For an overview of Australian evidence law, *see* JOHN D. HEYDON & RUPERT CROSS, CROSS ON EVIDENCE (8th ed. 2009); ANDREW LIGERTWOOD & GARY EDMOND, AUSTRALIAN EVIDENCE: A PRINCIPLED APPROACH TO THE COMMON LAW AND THE UNIFORM ACTS (5th ed. 2010). For an annotated commentary of the UEL, *see* STEPHEN ODGERS, UNIFORM EVIDENCE LAW (9th ed. 2010). On expert evidence, *see* IAN FRECKELTON & HUGH SELBY, EXPERT EVIDENCE: LAW, PRACTICE AND ADVOCACY (2005); Gary Edmond, *Specialised Knowledge, the Exclusionary Discretions and Reliability: Reassessing Incriminating Expert Opinion Evidence*, 31 U.N.S.W. L.J. 1 (2008).

[428] Also described as the "uniform law" or the "new evidence law," the UEL is comprised of the following: *Evidence Act* 1995 (Cth); *Evidence Act* 2011 (Aust. Cap. Terr.); *Evidence Act* 2008 (Vict.); *Evidence Act* 2001 (Tas.); *Evidence Act* 1995 (N.S.W.).

[429] In all of these jurisdictions, parochial evidence acts supplement the common law: *Evidence Act* 1977 (Queensl.); *Evidence Act* 1939 (N. Terr.); *Evidence Act* 1928 (S. Austl.); *Evidence Act* 1906 (W. Austl.). The rules of evidence regulating expert opinion in criminal proceedings are mainly common law and remarkably consistent across these jurisdictions.

[430] *Evidence Act* 1995 (Cth) s 4(1) (Austl.). The UEL does not apply to Commonwealth Family Court proceedings unless on appeal from certain State courts, most federal and state tribunals, and until 1998 did not apply to Indigenous land claims under the Native Title Act 1993 (Cth). *Evidence Act* 1995 (Cth) s 5-6 (Austl.).

approaches to incriminating expert opinion evidence and there is considerable convergence between the two systems.[431]

At common law, as in England and Canada, those with expertise are normally allowed to express opinions, provided the opinions are sufficiently relevant to the facts in issue.[432] The witness must have undergone training (and received appropriate qualifications or certification) or hold experience, and the opinion should be derived from a recognized "body of knowledge" (or "field'") or experience.[433] The opinion should also be of assistance to the tribunal of fact.[434] Rules preventing expert witnesses from expressing opinions on *the ultimate issue* or trespassing on matters considered to be within *common knowledge*—because of their invasion of the prerogatives of the jury—have in effect become moribund. Although, Australian common law judges (and their UEL counterparts) remain reluctant to admit the testimony of experimental psychologists on matters pertaining to human sensory experience and memory (e.g., on eyewitness identification).[435]

There is, in addition, a supplementary consideration: the *basis rule* (which persists under the UEL).[436] In its more technical guise, the basis rule requires that the facts on which an expert opinion is based must be identified, and in its strictest form, supported by admissible evidence.[437] This approach has been described by the full Federal Court as "a counsel of perfection" and, in consequence, tempered.[438] Another strand, requires the expert witness to explain the process or technique through which his or her opinion is derived—the so-called basis of the technique and opinion.[439] Provided the witness can articulate some kind of process, even if it involves speculative and untested techniques, that will ordinarily satisfy this version of the rule. In practice, both strands tend to be either ignored or treated perfunctorily in criminal proceedings.[440]

Under the UEL, there is an exception to the proscriptive opinion rule (s 76) for opinions substantially based on "specialized knowledge" derived from the witness's 'training, study or experience' (s 79).[441] Section 79 states:

> If a person has specialized knowledge based on the person's training, study or experience, the opinion rule does not apply to evidence of an

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[431] Victoria, however, may be slightly more exclusionary than the other UEL jurisdictions. *Compare Evidence Act* 1995 (Cth) s 76 (Austl.), *with Evidence Act* 2008 (Vict.) s 76 (Austl.).

[432] The common law maintains *sufficient* relevance, rather than *logical* relevance associated with the Evidence Act. *Evidence Act* 1995 (Cth) ss 55, 56 (Austl.).

[433] R. v. Bonython [1984] 38 SASR 45, 46-47 (Austl.).

[434] Clark v. Ryan [1960] 103 CLR 486, 491 (Austl.); Bonython, 38 SASR at 47.

[435] *See, e.g.*, R. v. Smith, [1987] VR 907, [14]-[17] (Austl.); *Evidence Act* 1995 (Cth) ss 79(2), 80. Judges are also reluctant to admit evidence about truth telling, as with polygraphs.

[436] LAW REFORM COMM'N, REPORT NO. 26 (INTERIM) EVIDENCE, para. 750 (1985).

[437] Makita (Austl.) Pty. Ltd. v. Sprowles [2001] 52 NSWLR 705, [85] (Court of Appeal) (Austl.); Dasreef Pty. Ltd. v. Hawchar [2011] 277 A.L.R. 611, [91]-[92] (Austl.).

[438] Sydneywide Distrib. Pty. Ltd. v. Red Bull Austl. Pty. Ltd. [2002] FCAFC 157, [7] (Austl.). *See also* Dasreef [2011] HCA at [25]; Alphapharm Pty. Ltd. v. H Lundbeck [2008] FCA 559, [758]-[59] (Austl.).

[439] Usually the derivation is linked to Davie v. Magistrates of Edinburgh, [1953] S.C. 34 (Scot.).

[440] *See, e.g.*, R. v. Jung [2006] NSWSC 658 (Austl.).

[441] *Evidence Act 1995* (Cth) s 76(1) (Austl.): "Evidence of an opinion is not admissible to prove the existence of a fact about the existence of which the opinion was expressed."

> opinion of that person that is wholly or substantially based on the knowledge.[442]

Judges in UEL jurisdictions have not taken the opportunity to read the need for ”reliability” into “specialized knowledge” or to substantially revise their common law practice.[443] Somewhat paradoxically, the leading case in NSW explicitly rejected the need to consider “an extraneous idea such as ‘reliability.”[444]

In consequence, UEL practice tends to resemble the common law, as lawyers and judges focus attention upon the qualifications of the witness and whether there is a “field” of “specialized knowledge”.[445] There are relatively few criminal decisions where incriminating expert opinion evidence is examined in detail or where the precise terms of s79 are applied rigorously to incriminating expert opinions.[446] Consequently, most incriminating opinion evidence is simply admitted and its weight left to the tribunal of fact. Under the UEL, the ultimate issue and common knowledge rules have been formally tempered, if not quite abandoned (s80).[447]

In addition, drawing upon and contorting authority from New Zealand and the Australian High Court—in relation to the preparation of transcripts of voice recordings—several Australian jurisdictions have developed the concept of the *ad hoc* expert.[448] These witnesses, usually investigators, though sometimes translators or formally qualified individuals, have been allowed to express their incriminating opinions on the basis of exposure to (or analysis of) some kind of evidence: usually repeated exposure to voice recordings or incriminating images. Originally developed to facilitate the admission of transcripts as an aid for the tribunal of fact when they were required to listen to the content of voice recordings of inferior quality, in recent years the use of *ad hoc* experts has dramatically expanded as Australian courts have allowed a variety of witnesses to express incriminating opinions about identity drawn from the rapid increase in the availability of images and voice recordings.

Allowing *ad hoc* experts to express opinions sits awkwardly with the common law because often the witnesses do not have appropriate qualifications and, to the extent that there is a relevant body of knowledge or experience, these particular individuals are not part of, or familiar with, it. Recourse to *ad hoc* experts also contravenes the explicit

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[442] The influence of the original Federal Rules of Evidence should be obvious. *Compare* Fed. R. Evid. 702, *with Evidence Act 1995* (Cth) s 79(1) (Austl.).

[443] *See, e.g.*, Velevski v. The Queen (2002) 187 ALR 233, [82] (Austl.); HG v. The Queen (1999) 197 CLR 414, 438-39 (Austl.).

[444] Notwithstanding the statutory interest in ‘specialised knowledge’ under the UEL, common law jurisdictions are slightly more likely to exclude expert evidence where the evidence is unreliable. R. v. Tang (2006) 161 A Crim R 377, 378 (Austl.).

[445] There is an explicit exception for opinions from indigenous persons on traditional laws and customs (s 78A), and s 79 was recently extended to make clear that opinions are not inadmissible merely because they concern the impact of sexual assault on the behavior of children: *Evidence Act 1995* (Cth) s 79(2)(a) and s 79(2)(b). *Evidence Act 1995* (Cth) s 78A (Austl.); *Evidence Act 1995* (Cth) s 79 (Austl.).

[446] There are very few civil trials before juries in Australia. In consequence, trial judges do not need to be as exclusionary in their civil justice practice. The participation of wealthy parties, frequently corporations, means that in many civil cases the parties dedicate considerable amounts of time and resources to developing and challenging expert opinion evidence. This is far less likely to occur in the very asymmetrical criminal contest, especially as the state has an effective monopoly on many sources of expertise and, in most trials, the resources available to the defense.

[447] *Evidence Act 1995* (Cth) s 80 (Austl.): “Evidence of an opinion is not inadmissible only because it is about: (a) a fact in issue or an ultimate issue; or (b) a matter of common knowledge.”

[448] G. Edmond and M. San Roque, *Quasi-Justice: Ad Hoc Expertise and Identification Evidence*, 33 CRIM. L.J. 8, 11-14 (2009). *Ad hoc* experts have also featured in proceedings in England and Wales, although the use has been questioned recently in R. v. Flynn [2008] 2 Cr. App. R. 20, 266, 271 (Austl.).

terms of the UEL for, s76 imposes an exclusionary rule that appears to cover the field.[449] Those purporting to express opinions on the basis of their interpretation of images or voices invariably possess no "specialized knowledge" or "training and experience" in voice or image comparison and analysis.

Only rarely do Australian judges use discretionary—and in UEL jurisdictions, their mandatory and discretionary—exclusions.[450] Australian judges seem to be reluctant to exclude potentially probative expert opinion evidence even where it is likely to be unfairly prejudicial—that is, unreliable and the jury likely to misuse or overvalue it. Rather than require the state to support the probative value of incriminating expert opinion with evidence of reliability or proficiency, common law and UEL judges tend to admit speculative opinions—such as those of *ad hoc* expert witnesses—because a jury might find unreliable or speculative opinions persuasive (i.e., "accept" them).[451] Questions about the value of evidence are conventionally left for the jury to determine (as matters for weight).

In addition, Australian judges maintain faith in the ability of warnings, directions and cautionary instructions to overcome problems with expert opinion evidence. The ability to comment, usually in quite general terms, about expert evidence and its dangers often facilitates the admission of evidence that might appear unreliable, speculative or controversial.

It is reasonably common for judges to hold a *voir dire*, following challenges to the admissibility of expert opinion evidence. NSW has also experimented with expert witnesses giving evidence *concurrently* in such preliminary proceedings.[452] Preliminary hearings rarely lead to the exclusion of incriminating expert opinion evidence adduced by the state. Though, judges may sometimes direct a witness to avoid the use of certain terms and expressions and encourage "splitting". None of the admissibility and regulatory interventions (e.g., the imposition of preferred expressions) is based on empirical research concerning underlying techniques, the value of trial practices or jury comprehension.

In practice, there is often little difference between the way common law and UEL courts approach the admissibility of expert opinion evidence. Notwithstanding developments in the U.S. and Canada, Australian courts have preferred their common law heuristics (i.e., "field" and qualifications or experience) and been reluctant to consider, let alone incorporate, "reliability" as an admissibility criterion for incriminating expert opinion evidence.[453] Judges in both common law and UEL jurisdictions exhibit a tendency to admit incriminating opinion evidence and leave questions about validity and reliability to the trial and the tribunal of fact. This liberal approach to admissibility and effective disinterest in reliability places both the risk of unreliability and the need to persuade the tribunal of fact of the weakness of unreliable opinions on the accused—all in the context of the accusatorial trial. Australian judges invest considerable confidence in defense

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[449] *Evidence Act 1995* (Cth) s 76 (Austl.).

[450] At common law, *Christie*, and under the UEL, s 137: "In a criminal proceeding, the court must refuse to admit evidence adduced by the prosecutor if its probative value is outweighed by the danger of unfair prejudice to the defendant." *See also* UEL 135 and 136; R. v. Christie [1914] AC 545 (Eng.); *Evidence Act 1995* (Cth) s 137 (Austl.).

[451] *See, e.g.*, R. v. Shamouil [2006] 66 NSWLR 228, [49] (Austl.); R. v. Carusi (1997) NSW LEXIS 1, 40 (Austl.); R. v. XY [2013] NSWCCA 121 (Austl.). Though compare R. v. Dupas [2012] VSCA 328 (Austl.).

[452] *See* Gary Edmond, *Merton and the Hot Tub: Scientific Conventions and Expert Evidence in Australian Civil Procedure*, 72 LAW & CONTEMP. PROBS. 159 (2009).

[453] "Reliability" is discussed, incidentally, in several cases. *See, e.g.*, Velevski v. The Queen (2002) 187 ALR 233, [82] (Aust.); HG v. The Queen (1999) 197 CLR 414, [82] (Austl.); Osland v. The Queen (1998) 197 CLR 316, 374 (Austl.); R. v. Bonython (1984) 38 SASR 45, 47 (Austl.).

lawyers and cross-examination, rebuttal experts, directions and warnings,[454] and the common sense of juries to identify and overcome weaknesses and limitations in expert opinion evidence—especially incriminating expert opinions.[455]

Australian judges and law reformers have been pre-occupied with the elimination of partisan bias and improving institutional efficiencies, particularly in civil litigation. Recourse to formal codes of conduct (for experts), along with the desire to extend the use of single experts, joint experts and concurrent evidence (so-called "hot tubs") from civil litigation to the criminal sphere, reinforce the primary interest in institutional efficiencies and longstanding concerns about expert partisanship rather than the validity and reliability of incriminating expert opinion evidence and the accuracy and fairness of criminal verdicts.[456] Except in the immediate aftermath of miscarriages of justice and wrongful convictions, and in response to a few specific types of evidence (e.g., bite marks), Australian judges have been largely disinterested in reliability and have devoted little attention to critical developments in the U.S. (or Canada).[457] Australian judges are yet to cite or engage with the NRC report, though their complacency, and indifference to empirical research and reliability, may be disturbed should the recommendations of the Law Commission of England and Wales, about the need for a formal reliability threshold in criminal proceedings, be embraced by English parliamentarians or judges.[458]

1. Latent Fingerprint Evidence

Latent fingerprint evidence is presumptively admissible in all Australian jurisdictions. The long history of admission, dating back to formal consideration by the High Court in *Parker. v. The King* (1912), has provided a largely uncontested admissibility pathway that has not been substantially revisited during the course of the century, notwithstanding technological refinements, changes in reporting practice and the introduction of the UEL.[459]

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[454] The most a judge might say is: '"Expert evidence is admitted to provide you with … information and opinion which is within the witness's expertise, but which is likely to be outside the experience and knowledge of the average lay person. The expert evidence is before you as part of all the evidence to assist you with … [set out the particular aspect(s) …]. You should bear in mind that if, having given the matter careful consideration, you do not accept the evidence of the [expert/experts], you do not have to act upon it. [Indeed, you do not have to accept even the unchallenged evidence of an expert]." These are taken from Criminal Trial Courts Benchbook (NSW). JUDICIAL COMM'N OF N.S.W., CRIMINAL TRIAL COURTS BENCHBOOK (2012), *available at* http://www.judcom.nsw.gov.au/publications/benchbks/criminal/index.html.

[455] The decision, by the defense, to obtain rebuttal expertise, often assuages any judicial concerns about incriminating opinion evidence.

[456] Gary Edmond, *Impartiality, Efficiency or Reliability? A Critical Response to Expert Evidence Law and Procedure in Australia*, 42 AUST. J. OF FORENSIC SCIENCES 83 (2010).

[457] There are a few incidental references to *Frye* and *Daubert*. On *Daubert*, *see* HG v. The Queen (1999) 197 CLR 414, 418 (Austl.); Osland (1998) 197 CLR at 375 (Austl.); Murdoch v. The Queen (2007) 167 A. Crim. R. 329, 354 (Austl.); R. v. Tang (2006) 161 A Crim R 377, 410-11 (Austl.); R. v. Karger [2001] SASR 1 (Austl.); R. v. McIntyre [2001] NSWSC 311, [14-15] (Austl.); R. v. Gallagher [2001] NSWSC 462, [35] (Austl.); R. v. Pantoja [1996] NSWSC 57, [17] (Austl.); R. v. Tillott [1995] NSWSC 83, [106], [111] (Austl.). On *Frye*, *see* R. v. Parenzee [2007] SASC 143, [63]-[64] (Austl.); R. v. Bjordal (2005) 93 SASR 237, 252 (Austl.); Mallard v. The Queen (2003) 28 WAR 1, [271]-[97] (Austl.); R. v. Jarrett (1994) 62 SASR 443, 447 (Austl.); R. v. Rose (1993) 69 A Crim R 1, [15] (Austl.); R. v. Brown [1990] TASSC 28, [25]-[26] (Austl.); Lewis v. The Queen (1987) 88 FLR 104, 121-22 (Austl.).

[458] Australian judges have looked primarily to England for law reform. Many, though not all, of the civil justice reforms were drawn from LORD WOOLF, ACCESS TO JUSTICE (1996) and consequent changes to the English rules of civil procedure (CPR).

[459] (1912) 14 CLR 681, 681 (Austl.). *See, e.g.*, Moreshead v. Police [1999] SASC 162, [8] (Austl.); R. v. SMR [2002] NSWCCA 258, [96] (Austl.). Like many longstanding forensic sciences, these have been effectively 'grandfathered'.

There are no formal restrictions imposed on what a latent fingerprint examiner might say, by way of identification. The expression of opinions, derived from the comparison of prints, is largely determined by latent fingerprint examiners (with sensitivity to other jurisdictions, originally the UK, though increasingly *Daubert* and NRC-inspired responses from the U.S.) rather than anything the court or independent research might demand. No minimum number of points is required, although numbers of points of similarity are frequently referred to in testimony and used to support the declaration of a "match" and the attribution of significance. To the extent that they offer positive testimony, latent fingerprint examiners ordinarily individualize.[460] That is, they declare a match between a latent fingerprint and a print on file as a positive identification to the exclusion of all other individuals.[461] There is no need for a latent fingerprint examiner to bring photographs or workings to court (to show the tribunal of fact), although most would probably be willing to do so. Where examiners do rely on exhibits the jury may be formally exhorted not to engage in its own assessment of the prints.[462]

There are relatively few challenges, and surprisingly few considered decisions on the admissibility and basis for identification evidence derived from latent fingerprint comparison. Positive identifications derived from latent fingerprints are very rarely contested and it is exceptional to have an expert appear for the defense. Cross-examination is usually superficial or non-existent and almost never addresses methodological issues and interpretations, as opposed to possible contamination or obvious mistakes. Judicial instructions do not tend to warn about the dangers of relying upon a latent fingerprint match as positive identification—other than in the general terms that even highly skilled experts might make mistakes.[463]

The few cases where fingerprint (and palm and footprint) evidence has been excluded (or appeals succeeded) involved fingerprint examiners failing to disclose substantial weaknesses in opinions or clearly moving beyond their legally-recognized competence. In *Hillstead v. The Queen* (2005), for example, the examiner purported to link a bloody fingerprint with the accused's presence at the precise moment of death.[464] This witness, however, had no information about the rate at which blood dries, or the temperature and humidity in the room, or whether the blood associated with the accused's latent fingerprint was from a pool or a thin smear.[465] According to the Court, the witness could only testify about the existence of a match and its significance in relation to identification. To say more was to transgress the boundaries of the witness's expertise.[466]

Problems with latent fingerprint evidence are understood and presented as individual failings (due to inexperience or hubris—going beyond the proper scope of the "field", as in the previous example) rather than problems with the underlying methodology and/or the totalizing manner in which results are expressed.

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[460] DNA and fingerprint experts are sometimes called to explain that no fingerprint or DNA sample was recovered.

[461] R. v. SMR [2002] NSWCCA 258, [86]-[91] (Austl.) (discussing Parker. v. The King, (1912) 14 CLR 681, 681 and Moreshead v. Police [1999] SASC 162).

[462] Bennett v. Police [2005] SASC 167, [7] (Austl.). Originally jurors were shown images to consider, but more recent cases suggest that it is experts who should undertake comparisons: R. v. Lawless [1974] VR 398 (Austl.).

[463] There is no heading in the Criminal Trial Courts Benchbook advising on judicial instructions for fingerprint evidence. JUDICIAL COMM'N OF N.S.W., CRIMINAL TRIAL COURTS BENCHBOOK (2012), *available at* http://www.judcom.nsw.gov.au/publications/benchbks/criminal/index.html.

[464] Hillstead v. The Queen [2005] WASCA 116, [34] (Austl.).

[465] *Id.* at [42].

[466] *Id.* at [63].

2. DNA Evidence

DNA evidence is interesting because trial judges and appellate courts were reasonably cautious in their uptake. Notwithstanding the traditionally liberal approach of the common law, several courts initially excluded, or upheld the exclusion of, DNA evidence: because the prejudicial effect was considered to outweigh the probative value; because of problems with the technology (e.g., whether faints bands were artifacts) and the danger that the jury might undertake their own comparison; because of questions associated with population statistics and the size of databases; and, because the jury might be confused or overwhelmed.[467] From the mid-1990s, around the time of the second NRC report (US), Australian courts largely accepted that DNA techniques were admissible (and reliable). Subsequently, challenges were almost always left to the trial and for weight. Since that time the major issues have been the introduction of new techniques and commercial kits (e.g., PCR and Profiler Plus), the soundness of databases and their applicability to indigenous populations, and the appropriate way to express results.

In *R. v. Jarrett*, the South Australian Supreme Court upheld the admissibility of PCR techniques even before the reporting issue was effectively settled by the second NRC report in 1996.[468] For Mulligan J, resolving disagreement between mainstream scientists was a matter for the jury.[469] In *R. v. Humphrey*, Bleby J dismissed an admissibility challenge to the database and distinguished the discretionary exclusions in *R. v. Green* and *R. v. Pantoja*.[470] The same Court also dismissed the challenge to the adoption of the Profiler Plus system, after an unusually lengthy *voir dire* in *R. v. Karger*.[471] More recently, in *R. v. Murdoch*, the Northern Territory Court of Criminal Appeal (NTCCA) expressed ambivalence about incriminating evidence, and expert disagreement, associated with results obtained through LCN techniques, though without deeming the incriminating opinions inadmissible.[472]

Other challenges have appeared in response to the population statistics applied to Australian Aborigines and some unexpected results from criminal databases, *possibly* due to recidivists changing names (i.e., using aliases).[473] Judges, particularly in NSW, continue to wrestle with the expression of results derived from population statistics. Originally, this emerged in relation to paternity indices (as opposed to percentages) and more recently in the way random match probabilities should be presented at trial.[474] The main issues occupying the appellate courts tend to be the expression of probabilities associated with DNA matches[475] and whether DNA evidence alone can sustain a conviction.[476]

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[467] *See* R. v. Pantoja [1996] NSWSC 57, [85] (Austl.); R. v. Jarrett (1994) 62 SASR 443, 455-56 (discussing R. v. Tran (1990) 50 A Crim R 233 (Austl.)); R. v. Lucas [1992] 2 VR 109 (Austl.); R. v. Green (unreported, NSWCCA, 26 Mar. 1993) (Austl.).

[468] R. v. Jarrett (1994) 62 SASR 443, 458 (Austl.).

[469] R. v. Karger (2001) 83 SASR 1, [659] (Austl.).

[470] R. v. Humphrey (1999) 72 SASR 558, 563-64 (Austl.).

[471] Karger (2001) 83 SASR 1, 125 (Austl.) (influential on R. v. McIntyre [2001] NSWSC 311, [8]). *See also* R. v. Gallagher [2001] NSWSC 462, [36] (Austl.).

[472] Murdoch v. The Queen (2007) 167 A Crim R 329, 363-64 (Austl.).

[473] *See, e.g.*, R. v. Pantoja [1996] NSWSC 57, [30]-[31] (Austl.).

[474] R. v. GK (2001) 125 A Crim R 315 (Austl.); R. v. JCG (2001) 127 A Crim R 493, [112] (Austl.); R. v. Lisoff [1999] NSWCCA 364, [49] (Austl.).

[475] Aytugrul v. The Queen (2010) 205 A Crim R 157, 174-76 (Austl.), *aff'd*, [2012] HCA 15 (Austl.). *See also* Andrew Ligertwood, *Can DNA Evidence Alone Convict an Accused?* 33 SYDNEY L. REV. 487 (2011).

[476] *See* Jeremy Gans, *A Tale of Two High Court Forensic Cases*, 33 SYDNEY L. REV. 515, 527-28 (2011).

In trials, the possibility of innocent transfer and the interpretation of results (e.g., electropherograms) are not infrequently explored in cross-examination. There have been a few successful appeals: where experts disagreed over interpretations of a mixed sample (*R. v. Juric*); where secondary transfer was not excluded by the prosecution (*R. v. Joyce*); and, where prosecution disclosure was incomplete (*Hillier. v. R*). Although, these cases should be considered exceptional.[477] Several high profile mistakes with DNA evidence, particularly in Victoria, have stimulated public and private inquiries, but these seem to have done little to temper overall confidence in DNA evidence.[478]

Today there are very few constraints on the admission and presentation of DNA evidence. Short of obvious contamination or clearly inappropriate forms of expression, DNA evidence is admissible and routinely admitted. Most of the institutions undertaking DNA analysis (for the prosecution) tend to report in probabilistic terms—purporting to be conservative, the probabilities almost never exceed 1 in 10 billion in written documents (at least). That is, greater than the number of persons currently believed to be living on earth. Where incriminating DNA evidence is not available the prosecutor often calls a forensic biologist to provide reasons for the failure to obtain any positive (i.e., incriminating) results—so-called "negative evidence."[479]

3. Bite Marks

The admissibility of the opinion evidence of dentists, orthodontists and odontologists on bite mark comparison and identification is complicated by a series of controversial convictions, particularly the role of English and Australian odontologists in the notorious wrongful conviction of Lindy Chamberlain for the murder of her daughter, Azaria ("the dingo baby").[480] Because of this negative experience, since the mid-1980s Australian judges have taken an uncharacteristically skeptical approach to incriminating bite mark evidence and several common law judges have demonstrated a willingness to exclude it.[481]

It is probably no coincidence that bite mark evidence is still considered by some judges and commentators as controversial. In *R. v. Lewis*, perhaps the leading Australian bite mark decision, the Court of Appeal of the Northern Territory considered the reliability, rather than just the field and qualifications (which were actually recognized, as satisfied, in the earlier *R. v. Carroll* (1985) appeal).[482] Interestingly, in considering the admissibility of incriminating bite mark evidence, the Court suggested that the Crown had a duty to explicate through evidence, "in ordinary language", the expert's "discipline and methods necessary to put them in a position to make some sort of evaluation of the opinions he expresses"—a form of the basis rule.[483] Where the expert evidence is of a

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[477] *See* R. v. Juric (2002) 129 A Crim R 408, [15]; R. v. Joyce (2002) 173 FLR 322, [324]; Hillier. v. Rex [2008] ACTCA 3.

[478] *See, e.g.*, F H R VINCENT, REPORT: INQUIRY INTO THE CIRCUMSTANCE THAT LED TO THE CONVICTION OF MR FARAH ABDULKADIR JAMA (2010).

[479] *See, e.g.*, Sankey v. Whitlam (1978) 142 CLR 1, 56.

[480] *See* EVIL ANGELS (Cannon Entertainment 1988); *see also* JUSTICE T.R. MORLING, ROYAL COMMISSION OF INQUIRY INTO CHAMBERLAIN CONVICTIONS (1987) (which was contemporaneous with Lewis v. The Queen (1987) 88 FLR 104 and R. v. Carroll [1985] A Crim R 410 and involved some of the same expert witnesses); *see also* Gary Edmond, *Azaria's Accessories: The Social (Legal-Scientific) Construction of the Chamberlains' Guilt and Innocence* 22 MELB. U. L. REV. 396 (1998).

[481] *See* Lewis (1987) 88 FLR at 115-17.

[482] Lewis (1987) 88 FLR at 123-24. *See* R. v. Carroll [2001] QCA 394, [6]-[8] (discussing R. v. Carroll (1985) 19 A Crim R 410 (Austl.)).

[483] Lewis (1987) 88 FLR 104, 124.

"comparatively novel kind, the duty resting on the Crown is even higher: it should demonstrate its scientific reliability."[484]

Lewis—like the early DNA appeals—is now decades old and sits awkwardly with the very accommodating trend toward incriminating expert opinion evidence currently in vogue under the UEL and the common law.[485] Because the individuals purporting to undertake bite mark analysis and comparisons possess tertiary qualifications, it is likely that Australian judges will gradually admit this evidence, even if longstanding skepticism manifests in restrictions upon the way interpretations are expressed (as in the case of images, below).

4. Incriminating Images and Voice Recordings

a. Opinions about Images

A range of individuals with formal qualifications and/or through repeated exposure are allowed to express opinions about the identity of persons of interest (POI) in images associated with criminal activity (e.g. CCTV recordings) or to interpret what is transpiring in them. Here we can observe how weak "body of knowledge or experience" and "specialised knowledge" are in practice. Judges have tended to allow those with formal qualifications in anatomy and physical anthropology or experience as forensic photographers and intelligence analysts—rather than photo-interpretation—and those who have acquired their "knowledge" or "experience" during the course of an investigation (such as police officers) to express incriminating opinions—usually about the identity of offenders (sometimes as *ad hoc* experts). The former group, with formal qualifications, are sometimes described as "facial mappers" or "face and body mappers."[486] Most use morphological (i.e., impressionistic assessments of form) rather than anthropometrical (i.e., quantitative) techniques of comparison. Of the variety of witnesses qualified as "expert" and allowed to express incriminating opinions, few have expertise in image interpretation and specialization in face and/or body comparison. Few, if any have a demonstrated ability to compare POI in conditions where the images are of low quality, highly distorted, poorly lit, out of focus, and the POI often wear disguises or baggy clothing and hats, and the images may be obtained years, and sometimes decades, apart.

Initially, these witnesses, including some with graduate qualifications, and senior academic positions, were allowed to express positive opinions about the identity of persons of interest (e.g., "one and the same"). However, more recently, they have been required to refrain from making positive identifications (i.e. individualizations) and to restrict their testimony to evidence of similarities and, in theory, differences.[487] Though, it is now common for Australian facial mappers to testify in terms of "high similarity" or "high level of anatomical similarity." Several have adopted the scale relied upon by many English witnesses (*see R. v. Atkins* and Table 1, above).[488]

Image comparison witnesses are routinely sent only two sets of images—one set of the person of interest and one reference set of the suspect (based on a police forensic procedure)—and are often told about the suspect and other features of the case. Such

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[484] *Id.*

[485] *See, e.g.*, R. v. Humphrey (1999) 72 SASR 558, 562-63 (Austl.).

[486] *See, e.g.*, R. v. Bonython (1984) 38 SASR 45, 47.

[487] R. v. Tang (2006) 161 A Crim R 377 at 384; Murdoch v. The Queen (2007) 167 A Crim R 329, 346-47; R. v. Tanner [2010] SADC 128, [5]-[8] (Austl.)*; R. v. A* [2010] SADC 126, [7]-[12] (Austl.); R. v. Miller[2008] SADC 86, [90]-[93] (Austl.); R. v. Harradine [2008] SADC 179, [33]-[37]; R. v. Dastagir [2013] SASC 26 (Austl.) R. v. Alrekabi [2007] NSWDC 110, [28]-[34] (Austl.).

[488] *See* R. v. Atkins, [2009] EWCA (Crim) 1876, [16]-[18] (Eng.).

suggestive procedures, to the extent that they are considered problematic or revealed, are treated as issues for cross-examination and weight (rather than admissibility or exclusion—on grounds of unfair prejudice).

Investigating police, with some familiarity of suspects—such as that obtained through the course of an investigation or prior arrest—are not allowed to express opinions based on the interpretation of incriminating images.[489] In contrast to England and Canada, this evidence is treated as inadmissible because of its deemed irrelevance—incapable of rationally assisting with the assessment of facts in issue, because the jury can make the same comparison—rather than because of reliability issues.[490] Police and other investigators are, however, allowed to express opinions, including positive opinions about identity, where they have some perceived advantage over the jury caused by changes in the accused's appearance or because the tribunal of fact will not have an opportunity to observe the defendant in motion (i.e., gait evidence).[491] These exceptions, to the general rule against positive identification, might be based on features as vague as the way a person holds their head, the tendency to swing an arm while walking, or due to a modified hairstyle or weight gain.[492]

Recently, the Court of Criminal Appeal in NSW, has excluded the opinion evidence of an anatomist concerning similarities in body shapes between images of a disguised armed robber and a person accused of the robbery.[493] In the absence of information about his method of photo-interpretation and without credible information about the prevalence of body shapes, the witnesses' similarity evidence was considered inadmissible.[494] The decision seems to have rendered "body mapping" evidence inadmissible (at least where the offender is well disguised) though without restricting the provision of facial comparison evidence relying upon analogous techniques.[495]

b. Opinions about Voices (and Sounds)

Expert opinion evidence about the identity of voices (and sounds) is generally admissible and admitted.[496] Voice identification evidence is even less regulated than the interpretation of images, and frequently (especially under the UEL) is not even treated as evidence of opinion.[497] As in Canada, the identification of a voice is often classified as direct evidence, or evidence of fact rather than interpretation (i.e., opinion). At common law, and under the UEL, language scholars and linguists are allowed to proffer incriminating opinions about identity.[498] Sometimes these opinions may refer to voices

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[489] Smith v. The Queen (2001) 206 CLR 650, 655-56, 657-70 (Austl.) (the majority treated the lay opinion evidence as irrelevant and thus inadmissible whereas Kirby, J., treated the lay opinion evidence as relevant but inadmissible).

[490] Smith v. The Queen (2001) 206 CLR at 655.

[491] *See* Nguyen v. The Queen (2007) 180 A Crim R 267, 272-73 (Austl.); Li v. The Queen (2003) 139 A Crim R 281, 294-95 (Austl.); Smith v. The Queen (2001) 206 CLR at 656.

[492] *See* Li (2003) 139 A Crim R at 294-95; Smith (2001) 206 CLR at 656. Limited familiarity may also provide a basis for a police officer to offer positive identification evidence, notwithstanding Smith (2001) 206 CLR at 653. *See, e.g.*, Nguyen (2007) 180 A Crim R at 272.

[493] *See* Morgan v. The Queen [2011] NSWCCA 257, [144]-[46] (Austl.).

[494] *Id.* at [132]-[33].

[495] *See id.* at [123]-[27] (citing R. v. Tang (2006) 161 A Crim R 377, 409).

[496] *See, e.g.*, Li (2003) 139 A Crim R at 292-93.

[497] *Id*. at 289-90.

[498] *See* R. v. Harris (No 3) [1990] VR 310 (Austl.) (citing R. v. McHardie [1983] 2 NSWLR 733; Gilmore [1977] 2 NSWLR 935 (noting that these cases are relatively old and involved the use of apparently discredited techniques such as spectrographs and sonograms)). *See* NAT'L RESEARCH COUNCIL, ON THE THEORY AND PRACTICE OF VOICE IDENTIFICATION (1979).

speaking in languages with which the listener is not familiar, and even where—as in most cases—their actual expertise is not in the realm of voice comparison.[499] Similarly, interpreters and translators and even investigating police officers without voice comparison training or experience, are allowed to express incriminating opinions, all as *ad hoc* experts, on the basis of their exposure to voices during translations, surveillance or interactions with the accused on arrest or during a search.[500]

All of these witnesses are allowed to make positive identifications (i.e., individualize) in circumstances where they are not familiar with the voices and even where the voices they are comparing speak in different languages (e.g., Mandarin and English) and their exposure, or the length and quality of samples, is limited.[501] In many cases, the witness is told by investigators, prior to their analysis, to whom the voice is believed to belong.[502]

As with image analysis, it is not clear that there is a mature field of forensic voice comparison capable of consistently producing reliable evidence about identity.[503] The need for a "field" or "specialized knowledge" tends to be either ignored or trivialized. Faced with the potential exclusion of incriminating opinions judges often refer to the, apparently unpalatable, alternatives of requiring the jury to listen to recordings that are often very long, of low quality and (arguably of) marginal relevance, and sometimes in foreign languages or, more radically, excluding the evidence. Significantly, juries are routinely encouraged to undertake their own voice comparisons, even where they have already heard the opinion evidence and the voices are speaking in different languages (e.g., English and the Nigerian language of Igbo).[504]

II. ANALYSIS AND DISCUSSION

Having supplied a survey of admissibility practices in four jurisdictions, this part draws on similarities and differences between these jurisdictions, as well as our collective research experience, to identify key themes in the admissibility of forensic identification sciences. Observing that admissibility practice tends to be similar across jurisdictions, we first anticipate and counter the proposition that widespread admissibility of forensic identification sciences reflects that the techniques are basically reliable. It is simply not possible to know the reliability of many common techniques because they have never been properly studied. In some instances, techniques that continue to be routinely admitted have

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[499] *Li* (2003) 139 A Crim R at 287-89.

[500] *Compare* R. v. El-Kheir [2004] NSWCCA 461, [96]-[98] (Austl.); *and* R. v. Riscuta [2003] NSWCCA 6, [7]-[8] (Austl.); *and* R. v. Gao [2003] NSWCCA 390, [20]-[24] (Austl.); *and* R. v. Camilleri (2001) 127 A Crim R 290, 296-97 (Austl.); *and* R. v. Leung [1999] NSWCCA 287, [6]-[11] (Austl.); *with* R. v. Rich *(No 6)* [2008] VSC 436 (Austl.); *and* R. v. Harris (No 3) [1990] VR 310.

[501] *See* Li (2003) 139 A Crim R at 287-88. *But cf.* Harris *(No 3)* [1990] VR 310, 322-23 (Ormiston, J., ruling that evidence should be excluded on judge's discretion due to questionable methodology).

[502] Relevant experimental literatures are almost never cited or discussed by lawyers or judges. Problems, to the extent that they are identified and recognized, tend to be conveyed in abstract terms to the jury. *See* Gary Edmond et al., *Unsound Law: Issues With ('Expert') Voice Comparison Evidence* 35 MELB.U.L.REV. 52, 54 (2011).

[503] Although, there is ongoing research into more robust forms of voice comparison. *See, e.g.*, Joaquin Gonzalez-Rodriguez et al., *Emulating DNA: Rigorous Quantification of Evidential Weight in Transparent and Testable Forensic Speaker Recognition*, 15 IEEE TRANSACTIONS ON AUDIO, SPEECH & LANGUAGE PROCESSING 2104 (2007).

[504] *See, e.g.*, Bulejcik v. The Queen *(1996)* 185 CLR 375, 381-82 (Austl.); Korgbara v. The Queen (2007) 210 FLR 36, 36-7 (Austl.); Neville v. The Queen (2004) 145 A Crim R 108, 124-25 (Austl.); Nguyen v. The Queen (2002) 131 A Crim R 341, [138]-[40]. *But see* R. v. Lawless [1974] VR 398 (wherein the jury is formally proscribed from assessing the fingerprint evidence, as opposed to the expert's opinion).

been demonstrated to be incapable of reliable individualization. This leaves us with the surprising conclusion that admissibility standards seem not to make much difference to the rigor with which courts scrutinize expert evidence. We canvass several possible explanations for the broad trend towards admitting expert opinion evidence without a demanding assessment of reliability, and consider some of the implications of this impulse. This part also considers some important differences among and between jurisdictions, and the possible sources of these differences.

A. Basic Conclusion: Admissibility Standards Do Not Seem to Make Much Difference

Our basic conclusion—which may surprise many readers, particularly lawyers, and disappoint those contemplating law reform—is that *formal admissibility standards do not seem to make much difference*. Formal admissibility standards, particularly those incorporating reliability, are not enforced in ways that regulate the reception of expert opinion evidence that is of unknown reliability. On the basis of the preceding examples, there does not appear to be a coherent, let alone principled, approach to the admission of incriminating expert opinion evidence in any of these jurisdictions and admissibility standards do not seem to clearly correlate with admissibility practice.

Table 2 (below) provides a summary of our basic findings. Given considerable variation in rules, the similarities in response should be considered revealing, especially where the reliability and appropriate way to express the results of most of these techniques continues to generate controversy.

Jurisdiction (and admissibility standard)	**DNA comparison**	**Latent fingerprint comparison**	**Bite mark comparison**	**Image comparison**	**Voice comparison**
US (reliability)	Admissible (probabilistic)	Admissible (individualization)	Admissible (individualization)	Admissible (individualization)	Admissible (generally not spectrographs)
Canada (reliability)	Admissible (probabilistic)	Admissible (individualization)	Admissible (individualization)	Admissible (non-expert opinion & individualization where familiar)	Admissible (individualization)
England (no reliability)	Admissible (probabilistic)	Admissible (individualization)	Admissible (individualization)	Admissible (individualization)	Admissible (individualization)
Australia (no reliability)	Admissible (probabilistic)	Admissible (individualization)	Admissible (individualization – some caution)	Admissible (similarities only; no 'body mapping')	Admissible (individualization)

Table 2: Summary of admissibility practice with respect to jurisdiction and type of evidence

Regardless of the admissibility standard, whether "assistance to the jury", "specialized knowledge", recognized "expertise" or "experience" (more below), "field" or the need for "reliability", all of the jurisdictions considered in this article admit most forensic science and medical techniques proffered by the state. They "qualify" individuals, sometimes highly trained scientists from adjacent domains, as experts. Individuals without *relevant* expertise or investigators whose only experience was obtained in an unsystematic manner during the course of a criminal investigation (or series of investigations) are also

frequently found by the courts to possess "expertise" that allows them to testify. While there are some variations in what these "experts" are permitted (or might prefer) to say, typically any qualifications imposed by courts bear no relation to what empirical research can support (or what the experts themselves might otherwise say: *see infra* Section II.C.).[505] Sometimes the absence of underlying research is used to impose restrictions (such as limiting those performing image comparison in Australia to descriptions of similarities) as something of an *admissibility compromise*, although that is not always the case (e.g. voice comparison in Australia). Moreover, most jurisdictions enable *legally qualified experts* to express opinions that exceed what available research could credibly support. "Legally qualified" or recognized experts are not necessarily experts in the sense that they are masters of their domain or can even do what they claim.

Contrary to the expectations of some, the introduction of new admissibility standards purportedly indexed to reliability in the U.S. and Canada has not radically disrupted historical settlements around admissibility practices and the expression of opinions.[506] Rather, the response to techniques and opinions, including new techniques, seems to be guided as much by an *inclusionary ethos* as a consistent interest in validity, reliability, error rates or proficiency.[507] Inverting procedural propriety, admissibility standards seem to be indexed to the proffered techniques with a general commitment to admission rather than a genuine interest in reliability (or even relevance).[508] Significantly, DNA evidence was exposed to aggressive challenges, (and higher admissibility standards), because: there was a great deal of published research and specialized knowledge in the possession of non-forensic scientists (i.e., mainstream scientific researchers); the defense eventually obtained access to highly qualified research scientists who were critical of existing practice; there was a good deal of controversy (and criticism from) beyond the courts; and, DNA profiling had many potentially valuable criminal justice uses so it was widely seen as important (by investigative communities, as well as politicians and judges) to "get it right." Even so, it took a public controversy characterized as the "DNA wars", two formal (extra-legal) inquiries, several years and hundreds of millions of dollars, to stabilize the technology and interpretations derived from population statistics.[509] At best, the courts played an indirect and inconsistent role in the refinement of DNA techniques and evidence.[510] Significantly, the responses to DNA evidence are not representative of responses to other types of forensic science and forensic medicine evidence.

Interestingly, recent challenges to the forensic sciences—primarily in the United States—emerged in the aftermath of *Daubert* and largely in the shadow of the controversy

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[505] Interestingly, expert witnesses are often willing to say more than courts will allow. It is the courts, rather than experimental evidence, that often shape the way experts express opinions. If experts had done the necessary research, courts would have much more limited grounds for overriding the bases for opinions. Intervention usually reflects ignorance and judicial concern, even if it does not lead to exclusion.

[506] Edward K. Cheng & Albert H. Yoon, *Does Fry or Daubert Matter?* 91 VA. L. REV. 471 (2005).

[507] *See* Gary Edmond & David Mercer, *Daubert and the Exclusionary Ethos: The Convergence of Corporate and Judicial Attitudes towards the Admissibility of Expert Evidence in Tort Litigation*, 26 LAW & POL'Y 231, 235-36 (2004).

[508] *See* Jane Campbell Moriarty & Michael J. Saks, *Forensic Science: Grand Goals, Tragic Flaws and Judicial Gatekeeping*, 44 A.B.A. J. 16, 28 (2005); Michael J. Saks & David L. Faigman, *Failed Forensics: How Forensic Science Lost Its Way and How It Might Yet Find It*, 4 ANN. REV. L. & SOC. SCI. 149 (2008).

[509] *See* JAY D. ARONSON, GENETIC WITNESS: SCIENCE, LAW, AND CONTROVERSY IN THE MAKING OF DNA PROFILING (2007); *see also* DAVID H. KAYE, THE DOUBLE HELIX AND THE LAW OF EVIDENCE (2010).

[510] *See* Gary Edmond, *Review Essay: The Building Blocks of Forensic Science and Law: Recent Work on DNA Profiling (and Photo Comparison)*, 41 SOC. STUD. SCI. 127 (2011).

associated with DNA evidence and its stabilization.[511] Challenges to the forensic sciences seem to have been an unintended (and largely unforeseen) consequence of *Daubert*—itself a response to perceived problems with expert evidence in civil proceedings—informed by the DNA wars, ongoing skirmishes around a range of forensic techniques (e.g., handwriting, voiceprints, latent fingerprints, bullet lead, ballistics and tool marks) and more recently and directly, authoritative intervention by the National Academy of Sciences (through the NRC) and high profile Innocence Projects.[512]

This is all revealing. It illustrates how admissibility jurisprudence and practice are potentially open to exogenous influences. Admissibility standards stipulating the need for reliable expert opinion evidence, though largely dormant in the criminal justice system, eventually stimulated sufficient dissonance to encourage scholarly criticism that led to NAS intervention. Admissibility standards are always available as a resource with the potential to be mobilized to challenge and exclude expert opinion evidence that is insufficiently reliable. Unfortunately, there seems to be limited interest in questioning technical abilities when it comes to the legal assessment of most of the comparison *sciences*. Not insignificantly, the operation of admissibility regimes predicated upon reliability seem to be confounded by earlier liberal admissibility practices that make reversals (i.e., exclusion) institutionally unsettling in criminal justice systems concerned with rectitude of decision, finality and managing their social legitimacy in societies increasingly anxious about crime and the costs of criminal justice.[513]

B. Reliability?

Before proceeding to consider a variety of issues and implications flowing from our basic conclusion (and research experience), we want to discount one possible response. It might be argued that admissibility *practice* is similar across these four jurisdictions because the various forensic science techniques are basically reliable. We believe this response to be untenable. Returning to the NRC report (and unanswered criticisms directed toward many forensic science and medicine techniques), it is our contention that, with the exception of most of the DNA techniques, among our sample there is limited research supporting many of the claims routinely advanced by forensic scientists in courts. In many domains the value of techniques is simply unknown. Rather than demonstrable evidence of reliability—such as validity studies that would inform our understanding of ability and accuracy—many of these and other techniques (e.g., comparison or analysis or foot, shoe and ear prints, hair and fibers, documents, ballistics, explosives, tool marks, blood spatter, stab wounds, soils and so on) are considered to be effective because they are used in investigations and prosecutions and have assisted in the production of "guilt." That is, forensic sciences (and forensic scientists) are often judged against their role in securing convictions. In some forensic science "fields", legal decisions to admit the evidence, the ability to withstand cross-examination, and contributions to guilty verdicts, represent the primary forms of "proof" of reliability—

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[511] Though, some challenges, such as those to handwriting, pre-date DNA evidence. *See* D. Michael Risinger, *Symposium: Daubert, Innocence, and the Future of Forensic Science: Goodbye to All That, or A Fool's Errand, By One of the Fools: How I Stopped Worrying About Court Responses to Handwriting Identification (and "Forensic Science" in General) and Learned to Love Misinterpretations of* Kumho Tire v. Carmichael, 43 TULSA L. REV. 447, 454 (2007); D. Michael Risinger & Michael J. Saks, *Science and Nonscience in the Court:* Daubert *Meets Handwriting Identification Expertise*, 82 IOWA L. REV. 21 (1996); D. Michael Risinger et al., *Exorcism of Ignorance as a Proxy for Rational Knowledge: The Lessons of Handwriting Identification "Expertise"*, 137 U. PA. L. REV. 731, 772-73 (1989); NAT'L RESEARCH COUNCIL, *supra* note 498, at 58.

[512] *See generally* BRANDON GARRETT, CONVICTING THE INNOCENT: WHERE CRIMINAL PROSECUTIONS GO WRONG (2011); BARRY SCHECK ET AL., ACTUAL INNOCENCE: FIVE DAYS TO EXECUTION & OTHER DISPATCHES FROM THE WRONGLY CONVICTED (1st ed., 2000).

[513] It is our contention that accuracy ought to trump finality.

sometimes characterized as "testing." In the absence of evidence of ability, derived from case-like conditions where correct answers are *known*—thereby excluding trials and guilty verdicts—legal responses do not provide appropriate grounds for epistemic confidence. Premature legal recognition of insufficiently reliable techniques and opinions may discourage research, contribute to the emergence and persistence of inferior techniques, and simultaneously threaten some of the primarily objectives of the accusatorial trial (*see infra* Section II.C.). In many cases unreliable forensic science techniques and misleading interpretations will have contributed to pleas and/or guilty verdicts. Inattention to capabilities and actual reliability means that evidence may have been misleading and processes unfair. The expert evidence may have been mistaken and in some proportion of cases independent opportunities to expose erroneous assumptions or leads, false confessions, or misleading evidence (such as erroneous eyewitness identifications) were lost.[514]

Inattention to the reliability of forensic science and medicine means that prosecution cases may appear stronger than they actually are (or were). Such impressions have the potential to mislead prosecutors, defense lawyers (at trial, and when advising on pleas), juries and judges as well as forensic scientists. The upshot is that legal practice is not a credible platform on which to ground claims about efficacy. The courtroom cannot replace validity, reliability and proficiency studies. Forensic science techniques can only be evaluated through *empirical study separate from* actual investigations and prosecutions.[515]

There is limited evidence to support the reliability of many forensic science techniques (the examples we have chosen are broadly representative), and in consequence, there is a need to explain admissibility in terms other than the actual research base and technical abilities. We accept that DNA profiling evidence represents something of an exception, but have included it as an influential recent development that casts much needed light on many established forensic science institutions, techniques and assumptions.[516] It is significant that many of the most aggressive challenges have been made against DNA evidence. Whether other forms of forensic science and medicine can (or even should) emulate DNA is contentious, though ultimately doubtful.[517]

With respect to many forensic science and medicine techniques (and expert opinions drawn from the social sciences and humanities), mimicking practices associated with DNA will be inappropriate.[518] This should not, however, divert attention from empirical study, notably validity and valuation studies—even if the results will rarely be

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[514] *See* GARRETT, *supra* note 512.

[515] *See* Bruce Budowle et al., *A Perspective on Errors, Bias, and Interpretation in the Forensic Sciences and Direction for Continuing Advancement*, 54 J. FORENSIC SCI. 798, 806-07 (2009).

[516] *See id.* at 804-06. We accept that some areas of forensic science are quite reliable. Many areas of chemistry are, for example, very reliable and, like DNA techniques, closely linked to research and commercial communities beyond the institutionalized forensic sciences. ARONSON, *supra* note 509, at 98. We also recognize that in some contexts, such as around the use of drugs in sport, where there are very considerable resources available (and at stake), the level of assessment and evidence is generally of a much higher standard than in many serious criminal investigations.

[517] This is, in part, a response to the power of DNA evidence, but also reflects the availability of independent experts able to testify about the processes and interpretations initially adopted by the state and manufacturers. *See* Budowle et al., *supra* note 515, at 804.

[518] *See* Gary Edmond & Kent Roach, *A Contextual Approach to the Admissibility of State's Forensic Science and Medical Evidence*, 61 U. TORONTO L.J. 343 at 391-95 (2011) (discussing R. v. Abbey 2009 ONCA 624).

as compelling as those associated with DNA profiling and population statistics.[519] Responses to DNA evidence, along with conspicuous differences between the responses to DNA evidence and many other areas of forensic science, illuminate inconsistencies (and unsustainable consistencies) in legal practice as well as the epistemic frailty of techniques (and opinions) that are not derived from scientific research and not routinely used by (non-forensic) scientists. Conclusions based on these techniques are routinely expressed in confident terms—where the accused is not merely implicated, but actually identified, often to the exclusion of all other persons in the world (or who have ever lived).[520] Legal responses betray serious limitations in law-science relations, including a remarkably accommodating response to forensic science and medicine evidence and authority, and are suggestive of the difficulties courts have encountered and will experience even more acutely as they endeavor to renegotiate longstanding admissibility settlements.[521]

C. Explanations for the Basic Conclusion

The basic conclusion that admissibility standards seem to make little difference in the admission of many types of forensic science, coupled with our rejection of the proposition that this reflects essential reliability, raises difficult questions about why it has proven difficult to focus legal attention on assessing reliability. In this section, we provide a number of linked explanations for this difficulty. Suggesting that courts have tended to use experience as a proxy for expertise, and that they have been generally uninterested in scientific literatures leads us to the possibility that judges and lawyers have substituted a legally-negotiated concept of reliability (which might be labeled *forensic reliability*) for the empirical concept of reliability that we might have expected to see. A seeming lack of interest in empirical studies of courts' practices has compounded this tendency. When inescapable problems do arise, as when wrongful convictions are produced by poor-quality forensic science and medicine evidence, courts tend to blame those problems on individual experts and thereby sidestep engaging with the possibility that legal processes might create systematic vulnerabilities to unreliable and speculative forms of expert opinion evidence. We suggest that the legal concept of *forensic reliability* is predicated on confidence in the capacity of trial safeguards, such as cross-examination, to reveal shortcomings in expert evidence, and that this trust in trial safeguards is accompanied by a faith in the capacity of triers of fact to understand expert testimony and combine it rationally with other evidence. In short, it may be that lack of attention to empirical research allows judges to remain unpersuaded that careful attention to reliability adds anything of substance to available trial safeguards. Given the disruptive potential of adopting a more critical stance towards routine forensic comparison evidence, and the often-stated desire to avoid intruding too far upon the role of the tribunal of fact, this ambivalence may help to explain judicial reluctance to engage deeply with reliability.

1. Demarcating Science from Non-Science, and 'Testing' and 'Experience'

Boundary work around what constitutes science, as opposed to some technical realm of expertise derived primarily from experience frequently tempers the application of reliability standards. Judges often read down the need for reliability to accommodate the practices of a field or group of practitioners rather than attend to what might be required to

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[519] *See* Jason M. Tangen et al., *Identifying Fingerprint Expertise*, 22 PSCHOLOGICAL SCI. 995, 997 (2011). DNA profiling and population statistics may actually be more straightforward than voice and image comparison. *See* Budowle et al., *supra* note 515, at 804.

[520] *See* Oregon v. Angius, No. 200924231, at *2 (Or. Cir. Ct. July 2, 2010).

[521] Historical confidence in time of death is a good example from forensic medicine. *But see* R. v. Truscott, 2007 ONCA 575 (Can.).

demonstrate that a technique is valid and accurate, or the practitioners genuinely proficient.[522]

There is much that could be said about philosophical and sociological work on science/non-science boundaries.[523] In the context of the forensic sciences, however, the primary issue is not whether some technique or skill is characterized as scientific (or non-scientific) or technical, but rather whether the individual can do what they claim and how we know this. In relation to the vast majority of techniques and practices, gauging proficiency requires some kind of empirical assessment. Too often forensic scientists and others involved in providing technical and scientific opinions in relation to investigations and prosecutions evaluate their performance against past legal recognition, convictions, and appeals to experience, as epistemic justifications. Such metrics are inappropriate. When it comes to techniques and practices that are used reasonably regularly, and especially those used routinely, there should be extensive testing of both the techniques and practitioners in realistic case conditions, *where the correct result is known*. This is the only way to obtain credible information about capabilities and limitations whether classified as scientific, technical or experiential.[524]

"Experience" is often used to recognize "expertise" and facilitate the admission of opinion evidence in the absence of experimental studies. While 'experience' is included as a basis for opinion in several jurisdictions—both common law (e.g., England, Canada and Australia) and "statutory" (e.g., FRE 702 and UEL s79)—courts rarely consider the particular experience in detail and very rarely take notice of how the experience was obtained, the nature of the experience and whether it is systematic and rigorous. One of the problems with recourse to "experience", that includes its role in techniques in regular or even routine use, is that we do not know if the technique works nor how accurate it is, nor if the *expert* performs better than a juror (or judge) or jury.

An individual's experience does not provide a basis to ground the admission of techniques and opinions that can be readily assessed but have not been. There is good reason to believe that people's experiences manifest very differently and equip them in quite divergent ways. Moreover, and this reflects the procedural difficulties associated with opinions predicated upon (or primarily upon) "experience", it can be very difficult to effectively challenge the testimony of persons who purport to base their opinions on experience. Opinions based on experience are frequently *ipse dixit* (i.e., bare assertion) even if they are not presented or understood in this way.[525] Where the witness is an *ad hoc* expert or, as in the case of Canadian image witnesses, proffers non-expert opinion evidence on the basis of quite limited familiarity with the accused, there are even fewer reasons to believe that the opinion offered by the witness is reliable. Moreover, such witnesses are not usually familiar with relevant literatures, appropriate processes or common mistakes, nor methodological limitations that might erode the probative (if not necessarily the persuasive) value of their opinions. Such opinions are difficult to challenge and lay people—both jurors and judges—are likely to assume that techniques in long or widespread use have been properly studied and shown to be reliable. Where experience is relied upon as the basis for admission (and credibility), the accused needs to persuade the judge and tribunal of fact about limitations, but must also overcome the implicit

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[522] This has been characterized judicially as 'sufficiently reliable' or 'threshold reliability,' though Professor Edmond prefers the phrase 'demonstrable reliability.' Edmond & Roach, *supra* note 330, at 345.

[523] *See, e.g.*, THOMAS F. GIERYN, CULTURAL BOUNDARIES OF SCIENCE: CREDIBILITY ON THE LINE 93 (1999).

[524] *See* Tangen et al., *supra* note 520.

[525] We do not wish to suggest that experience is not incredibly valuable, but rather to reject the assertion that experience alone is sufficient to ground admissibility for techniques. There is, instead, a need for empirical assessment. *Id*. at 997.

endorsement, even imprimatur, conferred by admission (and prior use). "Experience", in the absence of testing, tends to prevent appropriate scrutiny and weighing. In fact, when confronted with methodological and reliability challenges, it is common for courts and persons recognized (in court) as experts to place great weight on experience and historical use.[526]

2. The Absence of Scientific Literatures and Knowledge

One interesting feature of the focus on experience rather than testing is the infrequency with which courts are presented with relevant and recent research—let alone synoptic literature reviews pertinent to the issues before the court—from professional scholarly communities and researchers.[527] Rather, lawyers and judges often rehearse and imagine a range of issues that may, or may not, bear upon some of the main issues and problems with forensic science techniques and the expression of results as opinions—often from their own experience. These are sometimes expressed, though usually clumsily and only partially, in admissibility challenges and directions and warnings.[528]

In relatively few of the decisions are there references to relevant non-legal literatures or authority.[529] In most proceedings and, consequently reported decisions, the parties and the "experts" do not tend to refer to relevant scientific studies or bring the court's attention to the existence of critical literatures and challenges to the value of techniques or the manner in which evidence is expressed—even when these are known to the state's expert witness (and required by ethical obligations or formal codes of conduct).[530] As a result, lawyers, judges and juries are often oblivious to relevant literatures, critical commentary, experimental research and alternative techniques that might be directly relevant to the evidence and the issues confronting the court.

In most Anglo-Australian jurisdictions, judges are formally proscribed or informally discouraged from undertaking their own research. In consequence, trial and appellate judges are at the mercy of the parties and a system that does not adequately support the defense, particularly in relation to expert evidence. Admissibility decision-making is vitally important, but prosecutors and defense lawyers have been unwilling or incapable of improving admissibility practice. Notably, the NRC report has been cited in about fifty U.S. decisions, though with limited engagement and little deference. Notwithstanding its international implications, it has yet to be cited in a reported English or Australian judgment and its implications for forensic science and legal practice have not been taken seriously by courts.

It is not our intention to suggest that extant research and knowledge is necessarily clear-cut, or would always be decisive, but rather to draw attention to legal-forensic ignorance, omission and indifference. Current practices in all these jurisdictions—though perhaps less so in a tiny proportion of U.S. cases, where some techniques are aggressively

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[526] *See, e.g.*, R. v. Reed [2009] EWCA (Crim) 2698, 1 Crim. App. 23, [72]-[73] (Eng.); *Murdoch v. The Queen* (2007) 167 A Crim R 329, 346-47 (Austl.); *R. v. Harradine* [2008] SADC 179, [33]-[37] (Austl.).

[527] This may be reflected in the lack of references to scientific literatures in many judgments. *See* Gary Edmond et al., *Unsound Law: Issues With ('Expert') Voice Comparison Evidence* 35 MELB.U.L.REV. 52, 54 (2011).

[528] The exceptions would seem to be some amicus curiae briefs in the U.S. and where the defendant is very well-resourced. *See generally*, Brief of Amici Curiae Individuals Exonerated by Post-Conviction DNA Testing in Support of Respondent at 28, Dist. Att'ys Office for the Third Judicial Dist. v. Osborne, 557 U.S. 52 (2009) (No. 08-6) (arguing that DNA evidence is conclusive as biological evidence).

[529] Even DNA jurisprudence tends to rely on previous legal decisions. *See generally*, 68 AM. JUR. 2D *Searches and Seizures* § 288 (2012).

[530] *See, e.g.*, *Expert Witnesses in Proceedings in the Federal Court of Australia*, Practice Note CM 7 (2011); Bryan Found & Gary Edmond, *Reporting on the Comparison and Interpretation of Pattern Evidence: Recommendations for Forensic Specialists*, 44 AUSTL. J. FORENSIC SCI. 193, 193 (2012).

challenged (often with assistance from legal scholars and scientists)—have developed in ways that structurally exclude or discourage recourse to those who might actually know more.[531] Experience with DNA profiling would seem to be salutary in this regard.

3. Forensic Reliability?

In the absence of attention to scientific literature, it might be argued that the way judges have interpreted various rules and decisions has created a special legal (or forensic) definition of reliability. Legal negotiations and settlements around what reliability means has produced a somewhat incoherent meaning that has little relationship to what others, particularly scientists might mean by reliability. For judges, 'reliability' is often defined by: whether a person is formally qualified or (minimally) experienced; whether a technique has been used for a long time; whether a technique has been accepted by a court; whether a technique has been reviewed by another "expert" (i.e., peer review); whether a technique has survived cross-examination; whether a technique has been upheld on appeal; and, responsively, to the question of what the alternatives to admission of an expert's opinion might be.[532] These, as well as more orthodox uses, have created a very complicated, indeed incoherent set of resources that enable individual lawyers and judges to construct a very wide range of meanings around reliability that may have little if anything to say about the value of techniques, actual abilities and levels of accuracy.

To the extent that law, or legal institutions, develop their own models of reliability that have very little, if anything to do with ideas of (validity and) reliability in relevant scientific communities (concerned with epistemic considerations) or require attention to underlying research, these would seem to be creating scope for future challenges and dissonance and, in the criminal justice system, might be considered undesirable and possibly pathological. We accept that legal institutions may need to develop and articulate peculiar models of reliability designed for specific legal purposes, but these should be principle-driven, coherent and indexed to evidence or ability and what is known in exogenous knowledge communities.

The objectives of criminal justice systems, increasingly embodied in formal admissibility standards, would seem to require that forensic science and medicine evidence should be demonstrably reliable. That is, expert witnesses should be able to do what they claim, have procedures that minimize risks and error, and have a clear idea of limitations, sources and levels of error. They should also acknowledge evidentiary constraints, controversy and respond to authoritative criticism.

4. Legal Institutions Disinterested in Empirical Studies or Studying Their Own Practices

Compounding the problems presented by legally negotiated reliability standards, courts in all of these jurisdictions have been relatively inattentive to empirical studies of their own practices. Inattention is particularly pronounced in England and Australia.[533] Practicing judges have expressed little interest, and less practical action, in supporting methodologically rigorous studies of courts, trials and institutional practice.

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[531] Such cases often involve attentive scholars, frequently through the production of jointly authored amicus curiae briefs.

[532] *See, e.g.*, R. v. Bonython (1984) 38 SASR 45, 47 (Austl.). For example, judges seem reluctant to exclude 'expert' opinion where the jury might be left to undertake any analysis without assistance. *See* R. v. Tang (2006) 161 A Crim R 377, 381 (Austl.).

[533] *See generally* DAVID L. FAIGMAN, CONSTITUTIONAL FICTIONS: A UNIFIED THEORY OF CONSTITUTIONAL FACTS (2008); J.D. Heydon, *Developing the Common Law*, *in* CONSTITUTING LAW: LEGAL ARGUMENT AND SOCIAL VALUES 93 (2011). To be fair, little of this evidence is ever brought before judges and in many situations it is not obvious whether judges should or could respond.

The judicial disinterest in empirical studies is especially important because in many areas of legal practice, including areas where courts routinely admit(ted) techniques and derivative opinions, independent reviews of techniques and research have exposed (and continue to expose) serious methodological shortcomings and misleading forms of reporting opinions. Examples include: the use of voice prints (spectrographs), bullet lead analysis, handwriting comparisons, early population statistics associated with DNA matches, latent fingerprint evidence, and most recently the various techniques criticized in the NRC report. In each of these areas, academic commentators had criticized the techniques and lawyers and courts had, to varying degrees, ignored or marginalized these critiques—preferring jurors to determine the issue at trial. In the main, however, the criticisms of independent scholars have been consistently vindicated. This vindication has come through institutional disclosures, the research emerging from Innocence Projects, and scientific research and interventions (e.g., NRC report).[534]

Nevertheless, in many jurisdictions adjectival law reform tends to be predicated upon perspectives from the top of the legal pyramid (appellate judges and senior practitioners) and based on their unsystematic experience rather than empirical research or commissioned studies.[535] Given the performance of those outside the courts, and the difficulties experienced by lawyers and judges in all of these jurisdictions, it makes sense to think about developing institutional mechanisms, staunchly independent of the institutionalized forensic sciences and the courts, and not populated by stakeholder groups, to provide advice about forensic science and medical techniques that are (or become) controversial regardless of their longevity or apparent value.[536] Criminal courts should be cautious adopters of emerging forensic science and medical technologies.[537]

Given the limited resources available to the defense, along with the past performance of lawyers, judges and many expert witnesses, there is little sense in making the defense responsible for demonstrating that forensic science and medical evidence is unreliable, weak and/or developed in ways that tend to undermine any probative value it might possess.[538] That is, the accused should not bear the risk or responsibility of persuading the tribunal of fact about problems with expert opinion—including the unreliability and limitations with incriminating expert opinion evidence—particularly in the context of an accusatorial trial.

5. Problems Blamed on "Bad Apples"

While courts are particularly resistant to learning from academic research, it is harder to ignore the wrongful convictions and miscarriages of justice that have been associated with problems in forensic science evidence in each of the jurisdictions discussed.[539] Reports written about these miscarriages of justice often identify systemic

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[534] *See generally* GARRETT, *supra* note 512; NAT'L RESEARCH COUNCIL, *supra* note 498, at 58-69.

[535] We do not suggest that empirical research would be unequivocal about what should be done, but that it should be commission and considered.

[536] *See* Gary Edmond, *Advice for the Courts? Sufficiently Reliable Assistance with Forensic Science and Medicine (Part 2)*, 16 INT'L J. OF EVIDENCE & PROOF 263 (2012).

[537] In most jurisdictions, regardless of admissibility standards, judges tend to accommodate emerging, and sometimes unproven, techniques and technologies. *See* R. v. Atkins, [2009] EWCA (Crim) 1876, [27]-[31] (Eng.).

[538] Itiel E. Dror, David Charlton, & Ailsa Péron, *Contextual Information Renders Experts Vulnerable to Making Erroneous Identifications*, 156 FORENSIC SCI. INT'L 74, 77 (2006). *See also* Keith A. Findley & Michael S. Scott, *The Multiple Dimensions of Tunnel Vision in Criminal Cases*, 2006 WIS. L. REV. 291.

[539] In the U.S., *see, e.g.*, Brandon L. Garrett & Peter J. Neufeld, *Invalid Forensic Science Testimony and Wrongful Convictions* 95 VA. L. REV. 1, 1-97 (2009). In the UK, *see, e.g.,* R. v. Mark Dallagher [2002] EWCA (Crim) 1903 (Eng.). In Canada, *see* GOUDGE, *supra* note 354; FORENSIC EVIDENCE REVIEW COMM., FINAL REPORT (2004). In Australia, *see, e.g.*, VINCENT, *supra* note 478; MORLING, *supra* note 480.

failures within police investigations and the forensic sciences as well as failures of institutional culture.[540] Trial and appellate processes, and lawyers and judges, are less often subject to criticism. However, miscarriages of justice, wrongful convictions and associated inquiries, along with law reform proposals, rarely seem to produce long term or fundamental changes in admissibility practice. Rather, individual wrongful convictions tend to become associated with the poor behavior of particular experts (such as Harrow in the English image cases) or institutions, producing a discourse in which the "problem" of low quality expert evidence will be eliminated by the identification and exclusion of the bad apple(s).[541] On some occasions, scandal leads to censure and even the exclusion, at least for a time, of particular techniques or practices, such as voice spectroscopy in the U.S. and bite marks in Australia.[542] Scandals tend to be localized to particular techniques, practices and disciplines, and only rarely influence analogous practices and methodological indifference in other domains.[543]

The practice of blaming individual experts for their errors seems to mask broader practices that expose criminal investigation and prosecution processes to unreliable forensic science evidence. Unfortunately, any "lessons" are rarely learned and very rarely applied beyond a particular case or, as is more likely, an individual expert (or laboratory) *once discredited*. Even doubts and regular criticisms are unlikely to prevent admission until epistemic failure is confirmed. The case method and focus on individualized justice tends to accentuate these problems and frustrate the scope of more principled practice or reform.

6. Mediating Admissibility Strictures Because of the Trial Safeguards

The practice of relying on legally-negotiated reliability is predicated on judicial confidence in trial safeguards. Judges in all jurisdictions endeavor to ground their admissibility practice in relevant adjectival rules and jurisprudential traditions.[544] Concerns about the admission of "shaky"—that is weak or potentially unreliable opinions—tend to be mediated by the availability of trial safeguards and other protections. Implicitly, the protection provided by cross-examination, rebuttal experts, and instructions and cautionary warnings reduce or eliminate the risks to the accused from unreliable and speculative forms of expert opinion evidence. That is, the ability to cross-examine the expert, to obtain a contradictory or critical expert opinion, and for the judge to give directions and cautionary warnings, all serve to temper the rigorous application of exclusionary rules whether derived from the common law or otherwise (e.g. FRE 702 and UEL s79).[545]

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[540] *See also*, GOUDGE, *supra* note 354; VINCENT, *supra* note 478.

[541] Consider also Dr. Black in the English IRA cases, or Joy Kuhl in *Chamberlain v. The Queen (No. 2)*, Transcript of Record at Testimony of Joy Kuhl (1984) 153 CLR 521 (Austl.), 1984 WL 441785. See Clive Walker and K. Starmer, (eds), MISCARRIAGES OF JUSTICE: A REVIEW OF JUSTICE IN ERROR (1999). Consider also the responses to the performance of police crime laboratories in St Paul, Minnesota (2013), and Houston, Texas (2003).

[542] *See, e.g.*, Ohio v. Williams, 446 N.E.2d 444, 446 (Ohio 1983) (discussing jurisdictional differences regarding admissibility of voice spectroscopy evidence); Mark Page, Jane Taylor & Matt Blenkin, *Reality bites—A ten-year retrospective analysis of bitemark casework in Australia*, 216 FORENSIC SCI. INT'L 82 (2012).

[543] *See, e.g.*, GOUDGE, *supra* note 354, at 25 (focusing on individual and forensic pediatric pathology, but with relatively little influence beyond).

[544] *See, e.g.*, JOHN D. JACKSON & SARAH J. SUMMERS, THE INTERNATIONALISATION OF CRIMINAL EVIDENCE: BEYOND THE COMMON LAW AND CIVIL LAW TRADITIONS 27 (2012).

[545] FED. R. EVID. 702; *Evidence Act 1995* (Cth) s79 (Austl.).

A fairly typical expression of this commitment can be found in the *Daubert* decision.[546] On behalf of the majority, Justice Blackmun wrote, "Vigorous cross-examination, presentation of contrary evidence, and careful instruction on the burden of proof are the traditional and appropriate means of attacking *shaky* but admissible evidence."[547] In the *civil* sphere, and notwithstanding the 'relevance and reliability' regime he was inaugurating, Justice Blackmun explained that 'shaky' evidence was potentially admissible because it could be substantially addressed through traditional trial safeguards.[548] We question this as a principled response to incriminating expert opinion evidence in *criminal proceedings*. We also note that emerging research questions the effectiveness of trial safeguards both individually and in combination.[549]

In addition to the limited impact of formal admissibility standards, judicial discretions to exclude forms of evidence that might create unfairness, because of their potential to mislead the jury or because they are practically difficult to explain to lay decision makers—such as those embodied in the probative value/unfair prejudice discretion (e.g. FRE 403 and UEL s137)—are rarely used to exclude evidence that is not demonstrably reliable.[550] Once expert evidence is deemed to have satisfied formal admissibility rules—especially in jurisdictions with a reliability threshold—discretions are very rarely used to exclude. It seems that judges rarely consider the probative value of incriminating expert opinion evidence, preferring to leave such issues for the tribunal of fact (and "weight"). In some jurisdictions, a range of supplementary considerations have emerged to facilitate admission, such as compromises around the strength of expression (so-called "splitting"), or liberally admitting incriminating opinion where the defense has access to a "rebuttal" expert.[551]

The value and effectiveness of trial safeguards is uncertain. Cross-examination can have a devastating impact on an expert witnesses' testimony, and a rebuttal witness might change the way in which a decision maker understands expert evidence and even the case. On occasion, the trial judge might even identify the major limitations of an expert's opinions and convey them to a jury through cautionary warnings.[552] Generally,

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[546] Daubert v. Merrell Dow Pharm., Inc., 509 U.S. 579, 588 (1993).

[547] *Daubert*, 509 U.S. at 596. *Daubert*, it should be remembered, was a civil case dealing with the admissibility of epidemiological studies and meta-analyses. *See* CARL F. CRANOR, TOXIC TORTS: SCIENCE, LAW AND THE POSSIBILITY OF JUSTICE (2006).

[548] *Daubert*, 509 U.S. at 596.

[549] Gary Edmond & Mehera San Roque, *The Cool Crucible: Forensic Science and the Frailty of the Criminal Trial*, 24 CURRENT ISSUES IN CRIM. JUST. 51, 62 (2012); EMMA CUNLIFFE, MURDER, MEDICINE AND MOTHERHOOD 196 (2011); Keith A. Findley, *Innocents at risk: Adversary imbalance, forensic science and the search for truth*, (2003) 38 Seton Hall L.Rev 893.

[550] FED. R. EVID. 403; *Evidence Act 1995*, s137 (Austl.); *e.g.*, R. v. Jung [2006] NSWSC 658, [68]-[86] (Austl.).

[551] *See, e.g.*, Jung [2006] NSWSC at [76]-[86] (Austl.). On the 'equality of arms' more generally, *see* JOHN D. JACKSON & SARAH J. SUMMERS, INTERNATIONALISATION OF CRIMINAL EVIDENCE: BEYOND THE COMMON LAW AND CIVIL LAW TRADITIONS 83-85, 133-35 (2012).

[552] Note that this does not mean they will be understood. The ability to give directions and instructions with the authority of the court often mediates the admission of expert evidence, particularly in England, Wales and Australia. This response is interesting given that the research on judicial instructions, directions and cautionary warnings has repeatedly questioned their influence and therefore value. *See* NAT'L RESEARCH COUNCIL, *supra* note 505, at 58. In addition, a review of directions in Australia in response to voice identification evidence found that the content of instructions did not provide any scientifically-derived information and presented them in a way that made them practically difficult, perhaps impossible, to apply them. Rather than inform juries about the magnitude of risks of error, instructions tend to be remarkably general, often merely pointing to potential difficulties (e.g. the length of exposure was short, or the quality of the recording was poor) or these is no database, or the police officer was not very familiar, and imploring jurors to be cautious. Empirical studies revealing very high levels of error associated with the interpretation of voices and images, statements by learned societies imploring members not to use particular methods for forensic purposes, and the emergence of more

however, trial safeguards tend to be weak—much weaker than credible safeguards ought to be—and inconsistent in their operation. Their existence and presumptive claims as to their effectiveness are often used as grounds for admitting incriminating *expert* opinions that are neither demonstrably reliable nor effectively challenged. The many limitations associated with incriminating expert opinions are not usually canvassed or explained to juries. Juries are rarely provided with much detail and almost never with the assistance of relevant empirical studies, even where they exist.[553] Often, appellate courts treat the poor performance of lawyers, specifically in response to incriminating expert opinion evidence, as strategic decisions in the conduct of the defense.

In relation to these trial safeguards we might note that traditions, especially in England, Canada and some parts of Australia, of prosecutorial restraint seem to have little conspicuous impact on the handling of expert evidence.[554] In theory, the prosecuting attorney should aim to prosecute in a manner that is robust, but also principled and fair. Concerns with rectitude and fairness should extend to the use and reliance placed on incriminating expert opinion evidence that is unreliable or of unknown probative value. In addition, the prosecutor has a responsibility to direct attention to the actual value of expert evidence and concede and convey limitations with that evidence.[555] Where a technique is weak or untested, the state might be obliged to abstain from relying upon it even if the courts are willing to admit it.[556]

The ideal, rather than the reality, of trial safeguards, tends to be used to support admission and reliance upon speculative and unreliable forms of expert opinion evidence in all common law jurisdictions. Ironically, the limits of trial safeguards and prosecutorial restraint, individually and in combination, reinforce the need to be more aggressive about admissibility and to exclude evidence developed through techniques that are not demonstrably reliable.

7. Confidence in Juries and Judges (and Their Ability to Understand Complex Technical Evidence and Rationally Combine It with Other Evidence in an Accusatorial Setting)

Ultimately, the issue of admission determines whether the tribunal of fact—lay, whether jury or judge—will get to hear the testimony of a person formally recognized by the court (and the state) as expert enough to express opinions in criminal proceedings. Most judges express confidence in the ability of fact-finders to assess expert evidence regardless of whether it is adequately contested or explained and regardless of whether it is demonstrably reliable. Nevertheless, the jury's performance depends upon their understanding of the meaning of the decision to prosecute (e.g., that the accused is likely to be guilty), the way the trial is conducted, particularly representations by the prosecution and the adequacy of the defense, the way different types of evidence are combined, as well as general cognitive capabilities.

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technical methods by highly skilled linguists, statisticians and engineers all tend to be disregarded—whether deliberately or inadvertently. *See id.* at 60-69.

[553] *See* Gary Edmond, Kristy Martire & Mehera San Roque, *'Mere Guesswork': Cross Lingual Voice Comparisons and the Jury*, 33 SYDNEY L. REV. 395, 421 (2011).

[554] David S. Caudill, *Lawyers Judging Experts: Oversimplifying Science and Undervaluing Advocacy to Construct an Ethical Duty?*, 38 PEPP. L. REV. 675, 678-79 (2011).

[555] Michael Saks, *Scientific Evidence and the Ethical Obligations of Attorneys*, 49 CLEV. ST. L. REV. 421, 430-31 (2001). *See also* Myrna S. Raeder, *See No Evil: Wrongful Convictions and the Prosecutorial Ethics of Offering Testimony by Jailhouse Informants and Dishonest Experts*, 76 FORDHAM L. REV. 1413, 1417 (2007).

[556] The appropriate response might be to require research or the reform of investigative practices. *See* NAT'L RESEARCH COUNCIL, *supra* note 505, at 63-66.

Despite the expectation placed on the tribunal of fact, our criminal justice systems are not well designed to facilitate jury (or judicial) comprehension of expert evidence. It is far from obvious that juries perform well with expert opinion evidence or with the integration of different forms of expert and non-expert evidence. There is little evidence that judges perform much better.[557] Where there are serious methodological and/or statistical limitations or problems, or where there is no credible "research base", it is reasonably unlikely that this will be drawn to the attention of juries or explained in a manner that might lead them to appreciate how serious concerns voiced by the NRC, for example, actually are. We do know that juries do not perform well with statistical and probabilistic information (or with likelihood ratios) and this is the way that many types of forensic science are now being expressed—sometimes in the absence of underlying research (*see* Table 1).[558] In addition, there are good reasons to believe that judges and jurors struggle to disaggregate components of the case. Once they have heard evidence, even if it is not particularly probative, they may have serious difficulties discounting it. There is little evidence that judges or juries are capable of ignoring evidence, regardless of its admissibility.[559]

We do not say that juries are incapable of understanding complex evidence—although this requires further attention—but rather that our current institutional arrangements are not particularly well suited to jury comprehension. It may be that procedures could be dramatically improved, but even improvement might not be adequate for lay persons (including judges) to credibly cope with the tremendous variety of expert opinion evidence, and evidence that is especially complex (or technical), unreliable or of unknown reliability.[560] The limits of the tribunal, once again, reinforce the importance of admissibility decision-making and the reliability of incriminating expert opinion evidence. And yet, admissibility gate-keeping is dependent upon legally-trained judges who, for a variety of professional, ideological and pragmatic reasons, tend to maintain confidence in the state and its criminal justice institutions.

D. Implications of the Basic Conclusion

The implications of a lack of judicial attention to reliability are troubling. Most obviously, it is disconcerting that trial practice does not seem to have been altered by a major formal shift in admissibility standards. Courts and prosecutors have not yet engaged with the possibility that past convictions were based on unreliable evidence, or with the responsibility to review past practice that this realization entails. Adherence to forensic (or legal) reliability in lieu of empirical reliability allows courts to cleave to a precedent-based

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[557] There may be exceptions, such as where judges are regularly exposed to particular techniques, but this is not particularly common. *See generally* Margaret Bull Kovera & Bradley D. McAuliff, *The Effects of Peer Review and Evidence Quality on Judge Evaluations of Psychological Science: Are Judges Effective Gatekeepers?*, 85 J. OF APPLIED PSYCHOL. 574 (2000); Joel Cooper et al., *Complex Scientific Testimony: How Do Jurors Make Decisions?*, 20 LAW & HUM. BEHAV. 379, 387-93 (1996); Groscup et al., *supra* note 50, at 365, 367.

[558] Ben R. Newell et al., *Getting Scarred and Winning Lotteries: Effects of Exemplar Cuing and Statistical Format on Imagining Low-Probability Events*, 21 J. BEHAV. DECISION MAKING 317, 319 (2007); Kristy Martire et al., How Likely Is It that Fact Finders Understand Likelihood Ratios?, paper presented at Impressions and Expressions: Expert Opinion Evidence in Reports and Courts (December 2011), *in* AUSTL. J. FORENSIC SCI. (forthcoming 2012).

[559] Where the trial judge is also the tribunal of fact (i.e. the ultimate decision maker), he or she is obliged to subsequently disregard any evidence deemed inadmissible. Studies in the U.S. and Germany suggest that judges in common law and civilian traditions experience extreme difficulty disregarding evidence. *See* Andrew J. Wistrich et al., *Can Judges Ignore Inadmissible Information? The Difficulty of Deliberately Disregarding*, 153 U. PA. L. REV. 1251, 1270 (2005); JACKSON & SUMMERS, *supra* note 550, at 73.

[560] *See* Ronald J. Allen & Joseph S. Miller, *The Common Law Theory of Experts: Deference or Education?*, 87 NW. U. L. REV. 1131, 1144 (1993); Ronald J. Allen, *Expertise and the Daubert Decision*, 84 J. CRIM. L. & CRIMINOLOGY 1157, 1174 (1994).

approach, whereby opinions or techniques that have been admitted before the adoption of reliability standards continue to be admitted. This tendency persists at times even when there has been controversy about a technique or the evidence was originally admitted with caveats. Courts devote selective attention to empirical reliability where demonstrable reliability exists, while seemingly retaining a basic operating assumption that most evidence should be admissible. Worryingly, courts seem to reserve particular skepticism for experts called by criminal defendants. Overall, there is a serious lack of clarity around the expression of results, particularly when it is appropriate to individualize. The prevailing focus on experience rather than expertise discourages forensic scientists from testing the reliability of their work or becoming familiar with scientific literature and reasoning.

1. The Historical Legacy

One of the more confronting implications from revelations about the quality of forensic science and medical evidence, in conjunction with the emerging limits of legal practice, particularly the failure to consistently identify very real epistemic frailties during trials and appeals, is that many past convictions were probably mistaken, and very many criminal proceedings admitted incriminating expert opinions that were either wrong, grossly exaggerated or otherwise misleading. Very many criminal trials were, in consequence, substantially unfair.[561] Similarly, many guilty pleas were undoubtedly accepted from innocent persons—presumably over-represented by minority groups, the poor and the poorly educated—pragmatically responding to accusations predicated upon or bolstered by mistaken or misleading expert opinions. Unreliable and speculative expert opinions were often contaminated by exposure to prejudicial information but appeared as independent corroboration, even when the other evidence was mistaken—such as mistaken eyewitness identifications and confessions obtained under duress.

Where types of evidence, or individuals or laboratories are shown to produce mistakes, these should not be treated as isolated errors. Rather, there should be reviews (or audits) of other cases to determine whether poor practices are more widespread. In the wake of the NRC report, there would seem to be a need to review convictions substantially and systematically dependent on incriminating techniques and "expert" opinions that are not demonstrably reliable.[562]

2. Once Admitted, It's Here to Stay

Once a type of opinion or technique is admitted, typically it remains admissible unless some controversy emerges or evidence suggests that techniques and practices are completely unacceptable. Interestingly, there tends to be limited review of previous evidence, even once a technique is refined or shown to be limited. Moreover, where evidence is initially admitted with reservations or constraints, or because of the particular features of the case or the analysis, these restrictions are not always considered or applied in subsequent decisions. Initial limitations, as in the case of bite marks in the U.S. (following *Marx*) or the need for considerable familiarity to ground non-expert opinion in Canadian image cases (after *Leaney*), were elided or watered-down in subsequent practice.

Often the decision to admit a kind of technique or opinion in one jurisdiction provides support for similar practice in other jurisdictions. Legal practice in foreign

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[561] Even where the totality of the evidence might support guilt, admitting speculative opinions—often contaminated by knowledge of other prejudicial information—as independent support for conviction is inconsistent with a fair or rational process.

[562] This would apply to cases involving over-zealous prosecutors, incompetent defense attorneys, and judges who presided over cases.

jurisdictions, though not necessarily determinative, often seems to temper the way in which local rules of admissibility are constructed and may shift attention from demonstrable evidence of reliability (or actually enforcing admissibility standards).

Perversely, in terms of criminal justice principles, it seems much more difficult to have a forensic science or medical technique deemed inappropriate or inadmissible than admissible—regardless of the research support or risks of error.

3. Selective Attention to Reliability

This article documents that judges in the U.S., England and Wales, Canada and Australia have not required forensic scientists to establish, with empirical evidence, that their techniques are reliable, including techniques that have been relied upon for decades. Interestingly, the only technique that seems to have been exposed to quite demanding technical review, DNA profiling, was also the only technique where the defense obtained access to technical insights of undoubted authority at a preliminary stage, and is the only one of our techniques capable of satisfying a credible reliability standard *given the way interpretations are currently expressed*. Judges, in conjunction with the resource constraints on lawyers, have limited the scope and effectiveness of challenges to other (i.e., the non-DNA) forensic science techniques.

It is no coincidence that judges in England, Wales and Australia often refer to reliability, and sometimes validity and occasionally even refer to the copious amount of legal and non-legal published literatures, with respect to DNA. They tend to be less attentive to reliability, and it is of less value as a rhetorical resource, where a forensic science technique is not demonstrably reliable (and/or is controversial). Perhaps the primary exception is in the aftermath of high profile miscarriages of justice where (un)reliability is often an important rhetorical resource.[563]

4. Evidence of Defendants (and Plaintiffs)

Judges seem to believe that admitting as much evidence as possible is basically consistent with the primary goal of rectitude of decision (i.e., accuracy or "truth").[564] There is certainly a conspicuous trend in that direction in the Canadian jurisprudence.[565] Revealingly, the commitment to the admission of the state's expert evidence – approaching "free proof" – is not necessarily extended to expert opinion evidence adduced by plaintiffs in civil proceedings with juries (i.e., in the U.S.).[566] Nevertheless, judges in all common law jurisdictions have admitted *and continue to admit* the various forensic science techniques we have considered notwithstanding remarkably divergent levels of experimental support and quite different formal admissibility standards. Criminal trial

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[563] This occurred in response to the exoneration of the Birmingham Six, Guildford Four as well as the Splatt and Chamberlain Royal Commissions and the Canadian inquiries cited previously. These all led to proposals for change, but not ultimately to reliability-based research and admissibility practices.

[564] *See, e.g.*, LARRY LAUDAN, TRUTH, ERROR, AND CRIMINAL LAW: AN ESSAY IN LEGAL EPISTEMOLOGY 120 (2006).

[565] Made explicit by the Canadian Supreme Court in *Nikolovski*. *R. v. Nikolovski* [1996] 3 SCR 1197 (Austl.).

[566] 'Free proof' entails eliminating rules of admission to enable a more naturalistic (and implicitly rational) approach to the assessment of *all* relevant evidence. *See* JOHN D. JACKSON & SARAH J. SUMMERS, THE INTERNATIONALISATION OF CRIMINAL EVIDENCE: BEYOND THE COMMON LAW AND CIVIL LAW TRADITIONS (2012). Our essay is, at least implicitly, an argument against free proof—at least in its more non-reflexive guises. Not only are many of the formal rules and principles inconsistent with such a liberal response to incriminating expert evidence, but free proof and its proponents tend to overlook, or underestimate, the weakness of trial safeguards and the willingness of modern juries to convict. The admission of speculative incriminating opinions, expressed by individuals presented as experts, may be difficult to overcome, even where their opinions are contaminated, methodologically frail and mistaken. This has certainly been the case in many of the notorious wrongful convictions and miscarriage of justice cases in recent decades.

principles and values, like the application of admissibility rules, seem to be subservient to admission rather than the other way around.

In theory and practice the adversarial criminal trial is intended to produce accurate outcomes fairly.[567] Quite deliberately, modern criminal trial processes and rules are asymmetrical. Though primarily concerned with correct outcomes, the system is intended to operate in a manner that embodies the presumption of innocence and prevents a certain kind of error—namely, the conviction of the innocent. It is the state, in consequence, that is obliged to prove guilt to the exclusion of all reasonable doubt. With a few exceptions, there are relatively few expectations placed upon those accused of criminality. In addition, trials should be substantially fair - both in the way they are conducted and in the kinds of evidence produced and relied upon. This last point includes the ability to meaningfully respond to incriminating evidence.

All four of our jurisdictions feature a *one-size-fits-all* approach to expert opinion evidence. In theory, the same standard applies to evidence adduced by the state and the accused in criminal proceedings as well as to evidence adduced by plaintiffs and defendants in civil proceedings.[568] Nevertheless, our findings affirm that judges are particularly receptive to incriminating expert opinion evidence. These findings are nuanced by empirical research on criminal trials and appeals, as well as judicial responses to the expert opinion evidence adduced by plaintiffs in civil proceedings.[569] In contrast to the receptive, even *laissez faire* response to the state's proffers in criminal proceedings, the expert opinion evidence adduced by criminal defendants and plaintiffs tends to be more thoroughly scrutinized and held to more demanding standards.

These differential practices are difficult to square with legal principle. In principle, if there is to be disparity in the system, the most onerous standard should apply to incriminating expert opinions. The most accommodating standard should be applied to expert opinion evidence adduced by the accused.[570] Alternatively, all evidence should be held to precisely the same standard. Actual practice, in contrast, seems to invert legal principle.

It might be thought that the presumption of innocence, the requirement that the state prove guilt beyond reasonable doubt and the desire to only convict the guilty might justify the adoption of a more liberal admissibility threshold in respect of expert opinion evidence adduced by the accused.[571] The accused should, if there is any flexibility in admissibility standards, be given (greater) scope to introduce expert evidence that may raise a reasonable doubt or establish innocence.[572] In practice, the state's incriminating expert evidence is likely to secure easy passage, but when expert opinion is tendered by the accused it is more likely to undergo scrutiny and exclusion. In part, this is a result of the differential access to resources and information. Prosecutors tend to have superior

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[567] *See* HO HOCK LAI, A PHILOSOPHY OF EVIDENCE LAW: JUSTICE IN THE SEARCH FOR TRUTH 54 (2008); WILLIAM TWINING, THEORIES OF EVIDENCE: BENTHAM AND WIGMORE 7 (1985). This is also a primary goal of civil litigation, but that system is not as asymmetrical and there tend to be greater incentives to settle or produce practical outcomes efficiently.

[568] *E.g.*, LAW COMM'N OF ENG. & WALES, REPORT ON EXPERT EVIDENCE IN CRIMINAL PROCEEDINGS IN ENGLAND AND WALES 2.17 (2011).

[569] D. Michael Risinger, *Navigating Expert Reliability: Are Criminal Standards of Certainty Being Left on the Dock?*, 64 ALB. L. REV. 99, 128 (2000); Groscup et al., *supra* note 50, at 346.

[570] *See* Gary Edmond & Kent Roach, *A Contextual Approach to the Admissibility of the State's Forensic Science and Medical Evidence*, 61 U. TORONTO L.J. 343, 376 (2011).

[571] LARRY LAUDAN, TRUTH, ERROR, AND CRIMINAL LAW: AN ESSAY IN LEGAL EPISTEMOLOGY 85 (2006).

[572] Regardless of the value of finality, this should be accommodated at any stage of proceedings or incarceration. There will, of course, often be questions about what new techniques and evidence actually establishes.

resources and much better access to forensic scientists and consultants. They also tend to be more specialized and coordinated than many public (and private) defenders and so are in a better position to develop strategies, share information and successfully contest expert opinion evidence adduced by the defense. Expert evidence adduced by the defense, it should be acknowledged, is sometimes of questionable value or speculative and often presented by (forensically inexperienced) academic researchers rather than forensic science practitioners. However, given the preceding discussion of admissibility practice in response to many forensic science techniques that are currently relied upon by the state, allowing the accused to adduce expert opinion that might not be demonstrably reliable (or quite as demanding as any credible standard imposed upon the state) would not seem to be inconsistent with principle or the generally accommodating responses to incriminating expert opinion.[573]

5. Expression of Results

Inattention to what the NRC Report characterized as the 'knowledge base' underpinning many forensic science techniques has meant that the issue of how results should be expressed is often unclear—though not always explored (or conceded).[574] The lack of validation or proficiency testing means that in many areas forensic scientists speculate on the significance of results (often apparent "matches" or "similarities"). This may lead to attempts to express results cautiously, though in the absence of genuine insight about methodological and procedural issues, and information about distributions, imagined cautioned may be too cautious or—more troubling for the accusatorial trial—not cautious enough. Increasingly, lawyers and trial judges negotiate the way results may be expressed in courts, but this negotiation often follows from the lack of experimental research supporting a technique. Negotiations, forming part of an *admissibility compromise*, are not in any obvious sense indexed to empirical evidence. While they might, as in the case of some recent qualifications to latent fingerprint evidence in the U.S. and images in Australia, be better than unregulated assertions, they may nevertheless have no tangible empirical foundations or discernible effects. Recent research suggests that attempts by lawyers and judges to manage and perhaps mitigate the worst impacts of expert opinions through tempering expression may make little, if any, difference to the way incriminating opinions are actually understood—by the tribunal of fact.[575]

Differences in interpretations, conspicuous in the way DNA profiling and other techniques (*see* Table 2) are reported, are also revealing given the lack of research support for non-DNA comparison and pattern-matching techniques. DNA profiling, in contrast, has undergone extensive testing and lengthy discussions by well-resourced specialist groups that practically resolved a range of ongoing difficulties (and uncertainties).[576] Few other forensic science techniques have anything like the level of research support, multidisciplinary consensus, or highly trained experts in non-forensic domains using similar techniques and methods. When we compare the manner in which opinions are

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[573] Moreover, the practices of trial and appellate judges cannot be reduced to the quality of the counsel and arguments raised in admissibility hearings and trials. Judges appear to have an ideological proclivity toward the admission of incriminating expert opinion evidence. That proclivity might be based, in part, on a commitment toward admission (and even 'free proof') but again, these ideas and the asymmetrical response to evidence adduced by defendants (and plaintiffs in civil litigation) cannot be credibly explained in such terms.

[574] This emerged recently, controversially, and unsatisfactorily in *R. v. T.* in England. [2010] EWCA (Crim) 2439, 105-06 (Eng.).

[575] *See, e.g.*, Dawn McQuiston-Surrett & Michael J. Saks, *The Testimony of Forensic Identification Science: What Expert Witnesses Say and What Factfinders Hear*, 33 LAW & HUM. BEHAV. 436, 444-45 (2009).

[576] MICHAEL LYNCH ET AL., TRUTH MACHINE: THE CONTENTIOUS HISTORY OF DNA FINGERPRINTING, 83 (2008); ARONSON, *supra* note 515, at 98.

expressed, however, the non-DNA comparison (or identification) sciences are likely to be linked to positive identifications (so-called individualizations). This is the strongest form of expression: converting (apparent) similarities or "matches" into certain conclusions about identity or source. In some instances this may be because investigators and technicians are, or were historically (i.e., pre-DNA evidence), unaware of the complex issues associated with identification and individualization, particularly around similarities, the distribution of features in relevant populations, as well as a range of procedural biases that might influence interpretive and comparative practices.

There is no coherent rationale for the manner in which different types of evidence and opinions are expressed in reports and testimony. Rather, forms of expression are historically contingent, reflecting: the age of techniques and the length of admissibilty (with older techniques generally leading to higher levels of confidence or certitude); the amount of supporting research (the more research the more cautious, and empirically-predicated, expressions tend to be); the nature and extent of challenges; the degree of mobilization (and controversy) beyond the courts; the involvement of (non-forensic) scientists; and, the impact of notorious cases (e.g., bite mark cases in Australia or problems with voice spectrographs in the United States).

Older and empirically tenuous techniques frequently use the strongest forms of expression—e.g. a "match" as positive evidence of identity.[577] Most of these expressions were developed, or shaped, through ongoing interactions between courts and investigative communities. Perhaps inadvertently, and unwittingly, courts have actively participated in the production and legitimation of "expertise" and even "fields" through their admissibility practices.[578] Generally, admission (understood, and represented, as a proxy for reliability) has tended to stall interest in research. Somewhat perversely, verdicts, pleas, admissions, and the opinions of the experts themselves, rather than independent research have all been used to ground and support many of the claims associated with techniques not based on analysis of DNA. In some cases experience acquired during the course of an investigation by a police officer or a forensic scientist is considered adequate to ground admissibility, especially where the alternative is to allow the jury to examine "evidence" unaided or to exclude *potential* evidence. For a variety of reasons, not the least of which is the potential for embarrassment to criminal justice institutions, few prosecutors, judges or forensic scientists have much interest in destabilizing earlier admissibility settlements.

6. Implications for Forensic Science Practices

Legal (i.e., judicial) recognition of "fields" or "expertise" confers social and evidentiary legitimacy in circumstances where there may be few epistemic bases for that status. Courts should be looking for independent—that is, non-legal—evidence of ability. In the criminal sphere courts should be slow to confer their imprimatur (which may imply reliability), especially in jurisdictions requiring "reliability." The alternative is an undesirable tautology where legal recognition substitutes, almost always prematurely, for reliability.

As things stand, it is simply unknown whether many of the experts permitted to testify in courts can actually do what they claim, let alone how accurate they are. This is a deplorable state of affairs for all jurisdictions regardless of the admissibility standard. Courts have been instrumental in recognizing "experts" and "fields" and providing

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[577] These techniques are often used by individuals with less scientific and statistical training than scientists and technicians involved in DNA analysis. *See* LYNCH, *supra* note 582, at 11-12.

[578] SHEILA JASANOFF, SCIENCE AT THE BAR: LAW, SCIENCE, AND TECHNOLOGY IN AMERICA, 50-51 (1997).

alternative pathways (such as treating the evidence as non-expert lay opinion or treating recognition evidence as fact thereby circumventing opinion rules) that facilitate the admission and reliance on practices and opinions that are not necessarily accepted beyond forensic contexts. Many of those appearing in courts as expert (and non-expert) witnesses are not familiar with standard research methods or the kinds of studies that might illuminate the validity and reliability of their techniques. In consequence, many of those giving forensic science evidence are oblivious to, or inadequately trained to credibly deal with, some of the most pressing questions around validation and reliability and the ways in which to express opinions in reports and before lay persons.[579]

E. Differences Within and Among Jurisdictions

Our study documents the remarkable similarities in admissibility practices across the four jurisdictions (and their many states and territories). In this section we consider some of the differences in our sample. Notwithstanding overarching similarities, there are variations in the way some courts within and across jurisdictions manage different kinds of forensic science evidence and in some of the basic structures and resources that influence jurisdictional practices.

The interpretation of images and bite marks, for purposes of identification, are probably the most varied in our sample. Perhaps the variation stems from the influence of the *Smith* decision on Australian case law and the relative distribution of cameras.[580] In the U.S., England and Wales, and Canada, police with limited exposure to the accused—including "familiarity" acquired during the course of an investigation—are allowed to offer positive identification evidence through watching images of an alleged crime. In Australia, in *Smith*, the High Court largely prevented police identifications.[581] This has led to greater recourse to the opinions of 'experts' and non-investigative familiars.[582] England and Australia both seem to have more expert witnesses testifying in relation to facial, body, gait and clothing comparisons derived from images than Canada and the United States. This may be a consequence of more cameras, but would seem to be more closely linked to their accommodating jurisprudence. In the United States, expert witnesses commenting on images have largely relied upon photogrammetry. They are sometimes called upon by the defense in post-conviction reviews.[583] Allowing police to testify, as 'familiars' rather than "experts," may help to circumvent reliability standards for expert opinions in Canada. In Canada, in the place of expert witnesses, police officers, prison guards and parole officers tend to express their opinions about identity. The early case of *Leaney* provided access to the courts where there is sufficient "familiarity" (or recognition) and since that time there has been little need for more expensive and less predictable "experts."[584] The use of prison guards and parole officers in recent years probably reflects a desire to have individuals who appear independent of the investigation testify. Unavoidably, their participation reveals that the accused has prior convictions, often having served time in prison. This may be seen as acceptable in a jurisdiction relying heavily upon its judges for fact-finding. Notwithstanding these differences, all

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[579] Jennifer Mnookin et al., 'The Need For A Research Culture in the Forensic Sciences' (2011) 58 UCLA Law Review 725; Simon A. Cole, 'Acculturating Forensic Science: What Is 'Scientific Culture', and How Can Forensic Science Adopt it?' (2010) 38 Fordham Urban Law Journal 435; Gary Edmond, *Actual innocents? Legal limitations and their implications for forensic science and medicine*, 43 AUSTL. J. FORENSIC SCI. 177 (2011).

[580] *Compare* Smith v. The Queen (2001) 206 CLR 650, 656 (Austl.); *with* Nguyen v. The Queen (2007) 180 A Crim R 267, 274 (Austl.); *and* Li v. The Queen (2003) 139 A Crim R 281, 294 (Austl.).

[581] 206 CLR at 656.

[582] *See* Murdoch v. The Queen [2007] 167 A Crim R 329 (Austl.).

[583] Wisc. v. Avery, 807 N.W.2d 638, 647 (2011).

[584] R. v. Leaney, [1989] 2 S.C.R. 393, 415 (Can.).

jurisdictions enable some kind of 'expert' or criminal justice employee to proffer their incriminating opinions about the identity of persons of interest in images.

These differences are interesting because they imply that the various jurisdictions have different approaches to relevance—a logical concept—as well as the manner in which they treat fact versus opinion evidence at least in relation to images. The same concerns are not applied, or not applied consistently, in other areas, even though there would seem to be few conceptual reasons to distinguish the interpretation of images from the interpretations of sounds, by way of example, at a conceptual level. Moreover, relevance is rarely used to exclude expert evidence, even where the abilities of forensic scientists are uncertain and their opinions might be unreliable and, hence, incapable of rationally influencing the assessment of facts in issue.

Differences in response to bite marks are more difficult to explain. In part, they seem to be linked to underlying problems with techniques and interpretations as well as ongoing controversy associated with notorious miscarriages of justice and critical academic commentary. Although in Canada, dental evidence has been used to suggest problems with the state's allegations. Variation in responses to incriminating images and bite marks, along with the general responses to the other techniques, reinforce the unprincipled nature of admissibility jurisprudence and practice.

While there are differences in the responses to voice comparisons (and spectroscopy), bite marks, LCN DNA techniques and who gets to interpret incriminating images, practical differences, tend to be on the margins or relatively minor. In most cases, such opinion evidence is admissible (in some form), though occasionally subject to qualification or comment or restriction on precisely who is entitled to express the opinion. Even formally discredited techniques, such as some kinds of bite mark interpretations and voice spectroscopy, might be admitted subject to witnesses qualifying their opinions and, in England, Wales, Canada and Australia, judicial warning. Admissibility practice seems to have no direct correspondence with the value of evidence, admissibility standards (especially formally stipulating reliability), or the efficacy of safeguards such as cross-examination or directions and warnings.

III. CONCLUSION

Our comparative study and analysis identifies serious problems with the provision, reception and assessment of many forms of forensic science and medical evidence used routinely to investigate and convict citizens in all adversarial jurisdictions. Our study suggests that admissibility standards have not contributed to the exclusion (or informed systematic evaluation) of unreliable and speculative forms of incriminating opinion evidence in courts. Indeed, admissibility standards seem to have little discernible impact on the quality of forensic science and forensic medicine evidence. This applies to jurisdictions with common law and statutory standards, and includes jurisdictions that expressly stipulate the need for reliability.

In consequence, too much incriminating opinion evidence, based on techniques of unknown value and expressed in terms whose influence on lay persons is simply unknown, is routinely admitted in criminal proceedings. Our findings affirm that admissibility is important, and probably more important than conventionally believed, because adversarial proceedings, especially the quotidian trial (and here we might add plea bargains), are not well suited to identifying and conveying the complexities and limitations of expert opinions or providing a forum conducive to meaningful exploration and evaluation.

In order to improve performances, and to align more closely with espoused goals of accuracy and fairness (or truth and justice) and increasingly efficiency our lawyers and judges must be willing to exclude expert opinion evidence that is not demonstrably reliable. Legal institutions and personnel would seem to need to develop means of obtaining more mainstream and methodologically–sensitive advice and evidence. Without wanting to promote wholesale technocratic reforms, or to be understood to imply that accommodating exogenous knowledge and empirical studies would be straightforward, legal institutions must nevertheless begin to revise the ways in which they identify, admit and assess scientific, medical and other expert opinions. In the face of emerging criticism and evidence of wrongful convictions, continuing reliance upon unreliable and speculative opinions and blind faith in the value of trial safeguards will erode the social legitimacy of criminal justice institutions.[585]

[585] *See* Gary Edmond, *Advice for the Courts? Sufficiently Reliable Assistance with Forensic Science and Medicine (Part 2)*, 16 INT'L J. OF EVIDENCE & PROOF 263, 267 (2012).