

Effective Examination of Expert Evidence

Forensic Evidence in Criminal Proceedings

Current Legal Issues Seminar, 10 June 2021

Introduction by the Honourable Justice Peter Applegarth

Many of you are too young to have seen the late Bill Pincus in action, either as a barrister or as a judge.

He was a man of great learning and intelligence. One of his hobbies was astrophysics and he was interested in science more generally. He often would start a social conversation with “Have you read the latest part of *Scientific American?*”, to which my invariable answer was “No”, which then allowed him to tell me and others all about it.

One of his many celebrated feats of cross-examination of an expert witness occurred when he was a judge, not as lawyer. Judges are not supposed to examine witnesses. But Bill Pincus had certain European sensibilities, and so he would occasionally ask questions, in the style of a European judge, to aid the fact-finding process. Having quickly exposed some flaws in the expert’s evidence, Pincus added this barb:

“Call yourself a scientist?”

The judge was disappointed at a person of science not adhering to the scientific method.

Bill Pincus was an exceptional barrister, judge, and human being. We can never be as good as him, but we can always do better.

One way any barrister can do better when it comes to cross-examining an expert witness, and a forensic scientist in particular, is to have in your knapsack, and, more importantly, to have read, a 2014 *Australian Bar Review* article co-authored by Professor Edmond called: *How to cross-examine forensic scientists: A guide for lawyers*.¹

It is easy, sitting in the stands, to be critical of someone else’s performance on the field of play. But I am often perplexed by how easily expert witnesses in all manner of cases get away with expressing opinions without any serious challenge to their scientific or factual validity.

In your run-of-the mill personal injury case, expert witnesses freely express predictions about whether someone’s physical or psychological injury will get better, worse or stay the same in the years and decades to come. These opinions are important. They can have a big effect on damages. Very few barristers bother to ask the witness about the empirical basis for their prediction. If they ever do, we are told by the witness:

“I’ve been giving evidence in these kind of cases for 25 years”.

What this really means is: “I have been giving the same opinion for 25 years”.

¹ (2014) 39 *Australian Bar Review* 174.

That attitude embeds this proposition: “I am very experienced in expressing an opinion about this subject, and because I am very experienced, I am also very confident that my opinion is right”.

No one is ever so impolite to ask the expert whether they have gone back and checked how many of their predictions over say the last decade turned out to be right.

Confidence is a highly misleading guide to accuracy in decision-making.² Professor Daniel Kahneman suggests that confidence in a decision arises from the ease with which an answer comes to mind, coupled with a sense that the information relied upon to answer the question is coherent.³ But *ease* and *coherence* do not guarantee that a belief held with confidence is true.⁴

Compared to expert medical witnesses making predictions in court, weather forecasters don’t get it so easy. They have a rapid feedback loop and a very public demonstration when their opinions are wrong. As a result, they can improve the accuracy of their predictions.

In the risk assessments of the hundreds of individuals who have been subject to orders under the *Dangerous Prisoners (Sexual Offenders) Act 2003* (Qld) good forensic psychiatrists express important opinions about the risk of a respondent committing a serious sexual offence, based on actuarial instruments and their clinical assessments. In my experience, none are asked whether they have reviewed their past predictions, assessed how many of them were incorrect, and explored why they proved to be incorrect.

Bill Pincus, the barrister, would ask those kinds of questions, and so should you.

You’ll ask better questions of expert witnesses, including forensic science witnesses, if you read and absorb Professor Edmond’s work.

This applies not simply to experts’ predictions, but to their opinions about matters of fact like the force applied to cause a certain injury or whether a footprint matches that of the accused.

The speakers

Professor Edmond is a law professor in the Faculty of Law at the University of New South Wales, where he directs the Program in Expertise, Evidence and Law, and Research Professor (fractional), in the School of Law, Northumbria University. Originally trained in the history and philosophy of science at the University of Wollongong, he subsequently studied law at the University of Sydney and was awarded a PhD in law from the University of Cambridge. An active commentator on expert evidence in Australia, England, the US and Canada, he was until recently a member of the Council of the Australian Academy of Forensic Sciences and a member of Standards Australia’s Forensic Science Committee, he remains a member of the editorial board of the Australian Journal of Forensic Sciences, a Fellow of the Royal Society of New South Wales, and served as an international adviser to an Inquiry into Pediatric Forensic

² Emma Cunliffe, ‘Judging, Fast and Slow: Using Decision-Making Theory to Explore Judicial Fact Determination’ (2014) 18(2) *The International Journal of Evidence & Proof* 139, 160.

³ Ibid.

⁴ Daniel Kahneman, *Thinking, Fast and Slow* (Penguin, 2011) 239.

Pathology in Ontario. He is Chair of the Evidence-Based Forensics Initiative and is co-author of *Australian Evidence: A Principled Approach to the Common Law and the Uniform Acts*.

Our commentator, Saul Holt QC, was a Crown Prosecutor in New Zealand for 9 years and was appointed Senior Crown Counsel in 2005. He is a former Chief Counsel and Director of Criminal Law at Victoria Legal Aid. In 2012 Saul was appointed Queens Counsel and a Victorian Law Reform Commissioner before moving to Queensland in 2014. His practice includes all aspects of criminal and public law. Mr Holt QC is an ideal commentator on Professor Emond's address tonight. He has practical experience as a prosecutor in New Zealand and as a defence counsel in Queensland of forensic evidence of questionable validity or utility.

The subject of the seminar

Professor Edmond's body of work is extraordinary. It raises fundamental challenges to how we view apparently "hard" evidence-based expert opinions on matters of science, when, upon analysis, the validity, reliability and proficiency of the expert opinion is untested.

He raises an important issue about whether reliability should be part of the test for admissibility of expert evidence, as well as the possible role of discretionary exclusion for unreliable expert evidence.

Professor Edmond builds on sources such as President Obama's Council of Advisors on Science and Technology seminal report in 2016: [*Forensic Science in Criminal Courts: Ensuring Scientific Validity of Feature-Comparison Methods*](#).

Professor Edmond calls into question whether so-called experts in areas such as voice recognition and body images should be giving evidence. His more challenging proposition is this: if supposed experts in such a field should not be allowed to give evidence based on grainy photos of offenders and the like because their opinions are so unreliable, why should these grainy photos be admitted into evidence so inexpert juries can try to do what an 'expert' cannot. What is the effect of judicial directions about the appropriate use a jury may make of such evidence: that the evidence should be used for some limited purpose, such as resemblance, or examining for similarities, when the court is not provided with evidence about the prevalence of certain features that are said to be similar.⁵

Cross-examination about validity, reliability and proficiency

If expert evidence of dubious scientific value and poor reliability is admitted into evidence under our current laws of evidence, then we pin our hopes on effective judicial directions to juries (or self-directions in judge-only trials). A judicial direction is likely to be more intelligible to a jury if it has some evidence upon which to engage. Evidence about the scientific validity of expert evidence, error rates and the like should be part of the reports and evidence-in-chief of an expert. If not, it should be established in cross-examination.

We are fortunate to have professional forensic pathologists, who generally are careful about how they express their opinions. However, the forensic pathologists I have heard speak at

⁵ A similar issue arises as to the prevalence of a certain kind of ammunition in a murder case where a particular kind of bullet was used to kill: *Pentland v The Queen* [2020] QSCPR 10; *R v Pentland* [2020] QSC 231 at [105].

conferences are concerned that too little is done by defence counsel to challenge the reliability of the evidence upon which opinions are based, about how things like similarity are expressed by 'experts' who are not bound by or who do not adhere to certain ethical or professional standards about how such things should be expressed, and the cognitive biases that may affect the opinions being expressed.

Pentland's case: effective cross-examination based on Professor Edmond's work

Mr Holt QC is ideally suited to comment on Professor Edmond's work since he used it to great effect in *Pentland v The Queen*.⁶

The case concerns the admissibility of an isotope geochemist's evidence to link the ammunition used to kill the deceased with ammunition found after a police search at a co-defendant's home. The cross-examination by Mr Holt QC and by Mr Callaghan QC (as his Honour then was) was effective and led Lyons J to conclude at [43]-[53] that the methodology employed did not satisfy the criteria required for a forensic comparison method.

The Crown also wanted to rely on evidence from 130 ammunition suppliers in Queensland about the quantities of .32 calibre ammunition they had during the relevant period to draw conclusions about the prevalence of the kind of Norma projectiles that were used in the murder and which were found in the search. But there were inadequacies in the evidence about how much of that ammunition was imported into Australia either as factory loaded or as projectiles. This made it impossible to put any weight on the similarities.

Pentland's case is important beyond its facts and beyond the realm of forensic science. It has implications for the reception of expert evidence in both civil and criminal cases. It, like the work of Professor Edmond and his colleagues, should make us think about the pre-conditions for the reception of what purports to be "expert evidence" where the methodology used has not been scientifically validated, the evidence is unreliable or the proficiency (or otherwise) of the person giving the expert evidence is unproven.

A bibliography of Professor Edmond's work

To adopt, with respect, the words of Molly Meldrum, you should 'do yourself a favour' and Google search for Professor Edmond's publications, either articles he has written or co-authored with the inter-disciplinary specialists with whom he works. Here are [some](#).

If you find that list too intimidating, here are a couple to start with:

- Gary Edmond, 'Regulating forensic science and medicine evidence at trial: It's time for a wall, a gate and some gatekeeping' (2020) 94 *Australian Law Journal* 427. Available [here](#).
- Gary Edmond et al, 'How to cross-examine forensic scientists: A guide for lawyers' (2014) 39 *Australian Bar Review* 174. Available [here](#).

⁶ [2020] QSCPR 10.

- Gary Edmond et al, 'Forensic Science Evidence and the Limits of Cross-Examination' (2019) 42 *Melbourne University Law Review* 858. Available [here](#).
- Gary Edmond, 'Latent science: A history of Australian Fingerprint evidence in Australia' (2019) 38 *University of Queensland Law Journal* 301. Available [here](#).

Fingerprint analysis

On the issue of fingerprint analysis and identification evidence, we have the benefit of outstanding research by Associate Professor Jason Tangen from the University of Queensland and his colleagues,⁷ including:

- Jason Tangen, Kirsty Kent and Rachel Searston, 'Collective intelligence in fingerprint analysis' (2020) 5(1) *Cognitive Research: Principles and Implications* 23. Available [here](#).
- Matthew Thompson and Jason Tangen, 'The nature of expertise in fingerprint matching: experts can do a lot with a little' (2014) 9 (12) *PLoS ONE* 1. Available [here](#).

Some additional references

I do not pretend to be an expert in this field. I am not even an 'ad hoc' expert about experts. However, encounters with Professor Edmond and his colleagues at conferences in recent years drew my attention to some sources about forensic science.

Separately, and starting in 2015 as a result of attending a lunchtime seminar given by Professor Daniel Kahneman at the Federal Court in New York City, I became interested in the subject of cognitive biases amongst judges, experts and other human beings.

May I simply direct your attention to some sources. The first source, the PCAST report, has a helpful introduction to the issue of cognitive bias (extracted below as 2.4 Cognitive Bias).

A cognitive bias like confirmation bias has obvious implications when a forensic pathologist or fingerprint analyst is told some extraneous information about a suspect's criminal history or what another expert's opinion is on the same topic.

This is just one cognitive bias to which we are all subject. As I mentioned in a footnote in *R v Stamatov*,⁸ the subject of cognitive bias owes a great deal to Tversky and Kahneman's influential article, *Judgment under Uncertainty: Heuristics and Biases*.⁹ Its application in judicial decision-making is discussed by Associate Professor Kylie Burns in *Judges, 'Common Sense' and Judicial Cognition*.¹⁰

The issue of cognitive bias was popularised by Kahneman's best-selling work *Thinking, Fast and Slow*.

⁷ Professor Tangen's profile and publications are available [here](#).

⁸ [2017] QCA 158; [2018] 2 Qd R 1 at [64].

⁹ (1974) 185(4175) *Science* 1124.

¹⁰ (2016) 25(3) *Griffith Law Review* 319 at 330-331.

A different and equally important aspect of error in human judgment is explored in a new book co-authored by Daniel Kahneman, Olivier Sibony and Cass Sunstein called *Noise: A Flaw in Human Judgment*. They write:

Wherever you look at human judgment, you are likely to find noise. To improve the quality of our judgments, we need to overcome noise as well as bias.

An extract from PCAST Report:

The questions that DNA analysis had raised about the scientific validity of traditional forensic disciplines and testimony based on them led, naturally, to increased efforts to test empirically the reliability of the methods that those disciplines employed. Relevant studies that followed included:

- *a 2002 FBI re-examination of microscopic hair comparisons the agency’s scientists had performed in criminal cases, in which DNA testing revealed that 11 percent of hair samples found to match microscopically actually came from different individuals;*
- *a 2004 National Research Council report, commissioned by the FBI, on bullet-lead evidence, which found that there was insufficient research and data to support drawing a definitive connection between two bullets based on compositional similarity of the lead they contain;*
- *a 2005 report of an international committee established by the FBI to review the use of latent fingerprint evidence in the case of a terrorist bombing in Spain, in which the committee found that “confirmation bias”—the inclination to confirm a suspicion based on other grounds—contributed to a misidentification and improper detention; and*
- *studies reported in 2009 and 2010 on bitemark evidence, which found that current procedures for comparing bitemarks are unable to reliably exclude or include a suspect as a potential biter.*

Beyond these kinds of shortfalls with respect to “reliable methods” in forensic feature-comparison disciplines, reviews have found that expert witnesses have often overstated the probative value of their evidence, going far beyond what the relevant science can justify.¹¹

...

2.4 Cognitive Bias

In addition to the issues previously described, scientists have studied a subtler but equally important problem that affects the reliability of conclusions in many fields, including forensic science: cognitive bias. Cognitive bias refers to ways in which human perceptions

¹¹ President’s Council of Advisors on Science and Technology, *Forensic Science in Criminal Proceedings: Ensuring Scientific Validity of Feature-Comparison Methods*, Executive Office of the President of the United States, 2016 at 3. Available [here](#).

and judgments can be shaped by factors other than those relevant to the decision at hand. It includes “contextual bias,” where individuals are influenced by irrelevant background information; “confirmation bias,” where individuals interpret information, or look for new evidence, in a way that conforms to their pre-existing beliefs or assumptions; and “avoidance of cognitive dissonance,” where individuals are reluctant to accept new information that is inconsistent with their tentative conclusion. The biomedical science community, for example, goes to great lengths to minimize cognitive bias by employing strict protocols, such as double-blinding in clinical trials.

Studies have demonstrated that cognitive bias may be a serious issue in forensic science. For example, a study by Itiel Dror and colleagues demonstrated that the judgment of latent fingerprint examiners can be influenced by knowledge about other forensic examiners’ decisions (a form of confirmation bias). These studies are discussed in more detail in Section 5.4. Similar studies have replicated these findings in other forensic domains, including DNA mixture interpretation, microscopic hair analysis, and fire investigation.¹²

Other articles:

- Alice Towler et al, ‘Are Forensic Scientists Experts?’ (2018) 7(2) *Journal of Applied Research in Memory and Cognition* 199. Available [here](#).
- Jason Tangen, Matthew Thompson and Duncan McCarthy, ‘Identifying fingerprint expertise’ (2011) 22(8) *Psychological Science* 995. Available [here](#). And see: *Nguyen v R* [2017] NSWCCA 4.
- Melissa Taylor et al, ‘Latent Print Examination and Human Factors: Improving the Practice through a Systems Approach’ (2012) National Institute of Standards and Technology Report. Available [here](#).
- Jennifer Mnookin, ‘The Uncertain Future of Forensic Science’ (December 12, 2018). 147 *Daedalus* 99 (Fall 2018); UCLA School of Law, Public Law Research Paper No. 18-42. Available [here](#).

¹² Ibid at 32.