









defer to the authority or standing of the *expert* of the plausibility of the claim ...”

3.10 That then brings us to the question what does the jury have to know to be able to evaluate forensic evidence? Edmond at 83-90 sets out seven factors that need to be considered:

1. Does the “underlying techniques or process” for the testing actually work? This means consideration be given to whether or not there are independent validation studies that show – if the test works, how it will and in what conditions?
2. What are the limitations and uncertainties and the error rates associated with the technique?
3. How proficient is the analyst in using the validated technique?
4. Are there any standards applicable to the technique? Were they developed through formal testing and were they applied in this case?
5. Has there been any contextual bias?
6. What evidence is there about the frequency of a feature in relevant population? This is vital for matching a person or object to a crime.
7. Those evaluating opinions of forensic analysts need to be informed if the particular words or expressions used are “derived from and supported by independent research.”

3.11 These matters are considered and explained by Edmond et al in “How to cross-Examine forensic scientists: A guide for lawyers: (2014) 39 Australian Bar Review 174. Another excellent guide is Felicity Graham’s: Fingerprints and Expert Identification Evidence: Markers of Unreliability, October 2014 and available on line.

#### **4. A CONSIDERATION OF THE RELIABILITY OF SOME TECHNIQUES**

4.1 The NAS reported that, at 38:

“The term “forensic science” encompasses a broad range of disciplines, each with its own distinct practices. The forensic science disciplines exhibit wide variability with regard to techniques, methodologies, reliability, level of error, research, general acceptability and published material ... Some of the disciplines are laboratory based (e.g. nuclear and mitochondrial DNA analysis, toxicology and drug analysis); others are based on expert interpretation of observed patterns (e.g. fingerprints, writing samples, tool marks and bite marks). Some activities require the skills and analytical expertise of individuals trained as scientists ..., other activities are conducted by scientists as well as individuals trained in law enforcement ... medicine... or laboratory methods. Many of the processes ... are largely empirical applications of science – that is, they are not based on a body of knowledge that recognises the underlying limitations of the scientific principles and methodologies used for problem solving and discovery ...”

4.2 The problems largely occur in the nether world of pseudo-science where non-scientists give subjective evidence about pattern recognition largely in the absence of agreed standards and statistical analysis.

### **Finger Printing**

4.3 Fingerprinting has been the subject of adverse findings in two recent reports.

4.4 First, there was the “Experts Working Group on Human Factors in Latent Print Analysis: Improving the Practice through a Systems Approach”, US Department of Commerce, National Institute of Standards and Technology (2012), the “NIST Report”. A good summary of the NIST Report is found in Edmond at pp 53-66.

4.5 The NIST Report was quite critical on Fingerprint evidence. At p 72 the Group commented:

“a fingerprint identification was traditionally considered an ‘individualisation’ meaning that the latent print was considered identified to one finger of a specific individual as opposed to every other potential source in the universe, however, the recent attention focused on this issue reveals that this definition needlessly claims too much, has not been adequately established by fundamental research, and is impossible to validate solely on the basis of experience. Nor does fingerprint evidence have objective standards or a well validated statistical model that can provide an objective

measure of the strength of the fingerprint evidence in a given instance. Therefore, examiners should not claim to be able to exclude every other finger in the world as a potential source. Rather, an identification decision suggests a substantial enough similarity that the examiner believes that the two impressions originated from a common source ...”

4.6 Second, there was Lord Campbell, *The Fingerprint Inquiry Report* (AFS Group Scotland, 2011) the “SFI Report”. A good summary is found in Edmond at p66-71.

4.7 The SFI Report considered a prosecution of a police officer for perjury. The officer’s fingerprint was allegedly found in a shower where a person was murdered. She denied leaving it there and gave evidence at the trial that she never entered the bathroom where the alleged print was found. This evidence formed the basis for perjury.

4.8 With the help of foreign fingerprint experts the officer was acquitted. The controversy around that conviction led to a number of Inquiries with SFI being one.

4.9 Lord Campbell made 86 recommendations as a result of his Inquiry. The 10 most important are set out at p 67-68 of Edmond. Two of those were:

“1. Fingerprint evidence should be recognised as opinion evidence, not fact, and those involved in the criminal justice system need to assess it as such on its merits...

2. Examiners should discontinue reporting conclusions on identification or exclusion with a claim of 100% certainty or any other basis suggesting that fingerprint evidence is infallible ...”

4.10 There have been a number of publicised cases in the U.S. where errors have resulted in wrongful identification of people in a commission of a crime.

4.11 The NAS Report considers “Friction Ridge Analysis” which includes fingerprints at p 136-145. Its summary assessment at 142:

“ACE-V provides a broadly stated framework for conducting Friction ridge analyses. However, this framework is not specific enough to qualify as a validated method for this type of analysis. ACE-V does not guard against bias; is too broad to ensure respectability or transparency: and does not guarantee that two analysts following it will get the same results ... merely following the steps of ACE-V does not imply that one is proceeding in a scientific manner or

producing reliable results .... “We have reviewed available scientific evidence of the validity of the ACE-V method and found none.”

### **Other Pattern/Impression Evidence: Shoe Prints and Tyre Tracks**

4.11 The NAS Report deals with these at p 145-150. Its summary at 149:

“The scientific basis for the evaluation of impressions evidence is that mass-produced items ... pick up features of wear that, over time individualize them... However, there is no consensus regarding the number of individual characteristics needed to make a positive identification, and the committee is not aware of any data about the variability of class or individual characteristics or about the validity or reliability of the method. Without such population studies, it is impossible to assess the number of characteristics that must match in order to have any particular degree of confidence about the source of the impressions.”

### **Toolmark and Firearms Examination**

4.12 This topic is dealt with in the NAS Report at p150-155. The summary assessment at 154:

“Toolmark and firearms analysis suffers from the same limitation discussed above for impression evidence. Because not enough is known about the variabilities among individual tools and guns we are not able to specify how many points of similarity are necessary for a given level of confidence in the result ...”

### **Analysis of Hair Evidence**

4.13 This topic is examined at p 155-161 of the NAS Report. The summary at 160:

“No scientifically accepted statistics exist for the frequency with which particular characteristics of hair are distributed in the population. There appear to be no uniform standards on the number of features on which hair must agree before an examiner may declare a “match”.”

### **Analysis of Fibre Evidence**

4.14 Set out at pp 161-163 of the NAS Report. Summary as at p 163:

“Because the analysis of fibres is made largely through well characterised methods of chemistry, it would be possible in principle to develop an



understanding of the uncertainties associated with those analysis. However, to date, that has not been done ... “

### **Questioned Document Examination**

4.15 This topic is considered at p 163-167 of the NAS Report. The summary assessment is more optimistic at p 166-167:

“The scientific basis for handwriting comparisons needs to be strengthened. Recent studies have increased our understanding of the individuality and consistency of handwriting and computer studies and suggests that there may be a scientific basis for handwriting comparison ...”

### **Analysis of Paint and Coatings Evidence**

4.16 This topic is dealt with at p 167-170 of the NAS Report. This has a strong chemical basis and there are studies to back up a high degree of reliability of results.

### **Analysis of Explosives Evidence and Fire Debris**

4.17 Analysed at p 170-173 of the NAS Report. The conclusion was that a scientific basis exists for this type of analysis but much more research is required to determine natural variability of burn patterns and damage characteristics.

### **Forensic Odontology**

4.18 Considered at p 173-176 of the NAS Report. Conclusion:

“Although the majority of forensic odontologists are satisfied that bite marks can demonstrate sufficient detail for positive identification, no scientific studies support this assessment, and no large population studies have been conducted ...”

## **5. CONCLUSION**

5.1 While some forensic sciences such as DNA analysis and other laboratory based disciplines are capable of resulting in accurate and meaningful evidence in courts, there are many deficiencies in other types of forensic evidence. Those deficiencies occur where there is no scientific discipline underpinning the work, the people giving the evidence lack understanding of proper scientific methods and the limits of procedures.

5.2 Another major deficiency is that witnesses often overstate the results that they present to courts, claiming a positive match when there is no large and reliable database of population studies to support that conclusion.

5.3 The rules of expert evidence and the adversarial system has not resulted in a proper vetting of “forensic evidence” presented to the court. Much of the evidence is unsubstantiated assertions of opinion. In many cases there are no agreed standards, no proficiency testing and no reproducibility of results which means the evidence is worthless to the fact finder.

5.4 For generations, now, lawyers have been asleep on the job when it comes to forensic evidence. It is time to inform ourselves of the appropriate way to test it in court and to be more proactive. If not, miscarriages of justice, not capable of being fixed on appeal, will occur on our watch.

## SOURCES

1. National Research Council of National Academies, “STRENGTHENING FORENSIC SCIENCE IN THE UNITED STATES – A PATH FORWARD”, Washington DC, 2009.
2. Gary Edmond, “WHAT LAWYERS SHOULD KNOW ABOUT THE FORENSIC SCIENCES”, (2015) 36 Adelaide Law Review 33.
3. Gary Edmond, “FORENSIC SCIENCE EVIDENCE AND THE CONDITION FOR RATIONAL (JURY) EVALUATION (2015) 39 Melbourne University Law Review 77.
4. Felicity Graham, “FINGERPRINTING AND EXPERT IDENTIFICATION EVIDENCE: MARKERS OF UNRELIABILITY”, October 2014, on line.
5. Edmond, Martire and Rogue, “UNSOUND LAW: ISSUES WITH (EXPERT) VOICE COMPARISON EVIDENCE: (2011) 35 Melbourne University Law Review 52.
6. Gary Edmond et al, “HOW TO CROSS-EXAMINE FORENSIC SCIENTISTS A GUIDE FOR LAWYERS”, (2014) 39 Australian Bar Review 174.
7. A source of ongoing research on these issues is Euroforgen Network of Excellence at [www.euroforgan.eu](http://www.euroforgan.eu)