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Challenging Forensic Evidence? Observations on the use of DNA in certain criminal trials*

Mark Findlay and Julia Grix¹

Introduction

Our interest in forensic evidence, and in the use of DNA within criminal trials in particular, arises out of our recent responsibility to review² the *Crimes (Forensic Procedures) Act 2000* in New South Wales.³ This review engaged various methodologies to enable an understanding of forensic evidence procedures, from investigation through to courtroom practice. Crucially, the review explored the significance of DNA evidence within criminal trials in order to speculate on ways in which such evidence may be received by the trial 'fact-finders' in an appropriate and enlightening manner.

To appreciate the place of DNA evidence within criminal trials, it was necessary for the review team to explore the attitudes of professional trial participants, as well as individual juries exposed to the significance of such evidence.⁴ Along with interviewing public prosecutors, public defenders and defence advocates, as well as judicial officers, the review team observed the process of several recent trials in NSW⁵ wherein DNA evidence

* An earlier version of this paper was presented at the Eighth International Criminal Law Congress, Melbourne 2002. The authors have benefited from discussion which was stimulated by the conference and subsequent revision.

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2 The review was conducted by the authors (within the Institute of Criminology, University of Sydney), for the Attorney-General's Department New South Wales Government, in association with its Criminal Law Review Division. The review ran over the last half of 2002, reporting to the Attorney early in 2003.

3 Section 122 of the *Crimes (Forensic Procedure) Act* (the Act) requires that the Minister (the Attorney-General) review the legislation to determine whether its policy objectives continue as valid and whether the terms of the Act remain appropriate for securing those objectives.

4 With the generous assistance and cooperation of the Australian Institute of Judicial Administration, the review surveyed a selection of NSW Supreme and District Court juries at the conclusion of trials in which DNA evidence featured and in which it was contested in different circumstances. For instance, DNA evidence may have added to the circumstantial case as an identifier of participation, as identifying a victim, or in assisting to establish the nature of the accused's conduct.

5 In order to respect the anonymity of our juror surveys, we will not identify the trials observed by the review in which jurors were surveyed.

featured.⁶ Fortuitously, these raised unique and discretely interesting issues regarding forensic evidence and its treatment. In each trial, counsel on both sides positioned DNA evidence in very different ways and contested or argued for its relevance within several identifiable models.⁷

An essential interest of this paper is to describe and explain how DNA is employed in an effort to satisfy particular evidentiary exigencies during a criminal trial. Flowing from this is the interrogation of defence approaches to DNA and the themes that these demonstrate. Through critical examination (general as it may be at this stage)⁸ of prosecution and defence tactics in managing forensic evidence such as DNA, some speculation on future trial practice in this area is possible. In addition, we will make some general suggestions about how a 'best practice' approach to delivering and challenging DNA evidence could emerge. The need for such an approach is not only endorsed by a prevailing ignorance amongst many lawyers and judges about the nature and potential of DNA evidence, but also by recognising clear indications that DNA sampling will become a more regular and predictable feature of police investigations.⁹

Presenting DNA evidence in court

The observations of criminal trials in which DNA has featured recently in New South Wales suggest several separate justifications for the inclusion of this evidence in the prosecution case. These justifications complement the tactics of the Crown, often tending to demonstrate the manner in which DNA evidence is used to shore up otherwise fragile prosecutions.

Lawyers with experience of DNA evidence have suggested it is now less likely that the science of DNA profiling will receive routine challenge in court (see *R v Gallagher* [2001] NSWSC 462). Not unlike the manner in which fingerprint matching has come to be treated by most defence counsel as conclusive of identification,¹⁰ the introduction of convincing DNA matches will find more and more acceptance.¹¹ This reluctance to engage the science of DNA sampling, profiling and matching has given this evidence form a degree of legitimacy that enhances its attractiveness as a crucial evidentiary element in the prosecution case.¹²

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- 6 The nature and extent of these observations varied from engagement with full trials through to selective observations of the presentation of expert evidence, judicial directions, the cross-examination of witnesses, and closing addresses and summing up. Value was added to the observations in each case through access to trial transcript, and selective consultation with trial participants such as instructing solicitors, counsel, and judges.
 - 7 These went beyond cooperative or contested exchanges to those where identifiable scenarios of challenge emerged. For instance, testing the chain of custody within the laboratory is a technique that produces predictable courtroom outcomes. Several of the models or scenarios that the team observed may have arisen as a consequence of the difficulty associated with the evidence in question, or problems of differential access to evidence and analysis.
 - 8 The review report (yet to be released) provides far greater detail regarding the issues highlighted in this paper, in the context of the challenge and achievement of best practice strategies for forensic procedures.
 - 9 The experience in NSW has been that while the take-up of DNA sampling was slow and selective, it is now being promoted as a standard investigation practice. The explosion of crime scene sampling is one reason for the growing delays in laboratory analysis.
 - 10 Although a recent BBC Panorama programme exposed how flawed this assumption and the matching science may be: <<http://news.bbc.co.uk/1/hi/programmes/panorama/1983567.stm>> (7 February 2003).
 - 11 In a recent case, one lawyer commented that it seemed of little point to introduce evidence from their expert witness that might reduce the probability ratio arising out of the match from millions to hundreds of thousands.

Some of the reasons why DNA is relied upon in the investigation and prosecution of criminal trials tend to include:

1. Identification:

It is trite to say that a DNA match is not conclusive evidence of identification. In *Doherty & Adams*,¹³ when criticising the prosecutor's fallacy Lord Justice Phillips observed:

If one person in a million has a DNA profile which matches that obtained from a crime stain, then the suspect will be one of perhaps 26 men in the United Kingdom who shares that characteristic. If no fact is known about the defendant other than that he was in the United Kingdom at the time of the crime the DNA evidence tells us no more than there was a statistical probability that he was the criminal of one in 26.

Caution with the prosecutor's fallacy aside, jurors are persuaded by such probability ratios, and without careful direction may have a tendency to take DNA evidence as proof of identification in itself. However, the difficulty of formulating such a direction is further compounded by the fact that, at this time, there does not appear to be a clear consensus on the most effective means of calculating the probability of a coincidental match (NSW Legislative Council 2002:ix).¹⁴ We will return to this point later.

But what is it that DNA identifies? In most cases in which DNA evidence is used, the probability ratio is directed towards the assumption that the accused was somehow located at the crime scene. This may be from a discarded cigarette or from material on which a 'matching' DNA stain sample is found. The assumption is then drawn that not only was the accused's DNA present on the sample, but the sample links the accused to the crime scene.

Associated with location is the manner in which the presence of the accused at the crime scene would connect him or her to the crime in question. It is often argued, for example, that where a victim or witness is otherwise unclear about the identity of those present at a crime, DNA may add the critical piece to the puzzle so as to suggest that the location of the accused amounted to an active involvement. This seems particularly to be the case in sexual assault trials where the accused may initially dispute his presence at the scene of the assault and then, following the disclosure and analysis of DNA evidence, convert his argument to a dispute about consent.¹⁵

Besides the identification of suspects and their 'matching' with crimes and crime scenes through the use of DNA, the review has observed cases in which the identity of the victim in a homicide trial relied on DNA evidence. This involved the extraction of DNA from human remains that were linked scientifically back to a victim of crime. Despite such powerful applications of DNA technology,¹⁶ the problems associated with the

12 This is not meant to suggest that analytical conventions governing the chain of custody and the purity of the sample are not regularly challenged — see for instance, *R v Sing* [2002] NSWCCA 20; *R v GK* [2001] NSWCCA 413; *R v To* [2002] NSWCCA 247.

13 *Supra* n 13.

14 For this reason, the Standing Committee has recommended that the proposed State Institute of Forensic Sciences examine the best method of calculating the significance of a match.

15 See, for example, media reports of certain high profile sexual assault cases which tend to confirm this: <<http://www.smh.com.au/articles/2002/08/15/1029113983342.html>> (7 February 2003).

16 Note the distinction drawn in *R v Keir* NSWSC 70012/02 between Mitochondrial and Nuclear DNA and the expertise relied upon to engage with it. The former process of analysis can only trace the maternal link and the latter relies on both. In this case, the results were tendered to establish that the DNA result extracted from the bones was consistent with the bones having belonged to the offspring of the parents of the missing woman.

identification of suspects or accused persons transfers with the same cogency to the identification of victims' remains.

2. Circumstantial evidence:

DNA evidence may be nothing more than one element of the prosecution case requiring corroboration from other more conventional forensic forms. Outside their prevailing obligation to direct juries on the nature and construction of circumstantial cases, we have observed judges being particular in their efforts to correct any disproportionate weighting of DNA evidence. Such directions have not surprisingly formed a basis for appeal over the treatment of DNA evidence (see, *R v Cohen* [2002] NSWCCA 339).

Among other important circumstances qualifying forensic evidence is the use of DNA evidence to locate an accused at a crime scene being challenged by competing alibi evidence. The significance of the DNA probability ratio in this instance is critically dependent on what else might be known about the suspect's activities at the time of the crime. An alibi may be sufficient to deny the accused's responsibility despite his or her 'matching' DNA profile. If, however, the accused was near the scene of the crime when it was committed or had been identified as a suspect because of other evidence suggesting that he or she may have been responsible for the crime, the DNA evidence becomes very significant. For example, the possibility of two men with matching DNA being in the vicinity of the crime will seem almost incredible and a comparatively slight nexus between the defendant and the crime (independent of DNA) is likely to suffice to present an overall picture to the jury that satisfies them of the defendant's guilt.

In saying this, it would be wrong to assume that DNA evidence is just like any other piece of the circumstantial evidence puzzle. While corroboration of a convincing probability ratio may be necessary to remove doubt from the mind of the jury, the compelling nature of DNA gives it a special relevance for a circumstantial case. A Crown Prosecutor has commented to the review that without the inclusion of DNA evidence, the circumstantial case in question would not have been prosecuted. The inference is that DNA becomes the centrepiece of a circumstantial case and only requires corroboration of the slightest form to confirm its significance.

In one trial reviewed by the team, the jury accepted the importance of DNA evidence founded on preconceptions as well as the arguments of counsel, while at the same time having little difficulty in discounting it within the amalgam of a circumstantial case. DNA was not the evidence to confirm the circumstantial mix, where corroborative evidence was challenged, and the connection between DNA as an identifier and a vital incriminator was challenged. In this trial, counsel tended to concede the relationship between the sample, the profile and the accused, but fundamentally disputed what this indicated, if in fact anything at all, concerning criminality.

The presentation of DNA evidence in this trial was orchestrated around an agreed expert explanation of the science and its analysis. This clearly created an atmosphere of understanding for the jury. The defence, however, sought to impugn the place of DNA as corroborative circumstantial evidence. They were able to manage the jury's understanding of the science to introduce another plausible interpretation of its significance and thereby challenge the Crown's claim that it completed the circumstantial puzzle.

3. Other reasons for the presentation of DNA evidence include:

- *Corroboration* where there exist other convincing identifiers.
- The introduction of evidence regarding an *unknown minor contributor* who then may remain in the background to cast doubt by inference on any assertion that DNA conclusively connects the accused with the crime. There is a danger for the Crown in presenting and relying upon mixture DNA evidence (that is, where there is more than one contributor to a sample) when it neither establishes guilt nor innocence per se, but may be consistent with an alternative theory of how an offence was committed and by whom. As a defence tactic, this may enable the other side to counter the introduction of DNA and co-opt it into their fabric of doubt.

There can be no doubt that DNA evidence will take on a more significant role in criminal prosecutions in any of the above situations as DNA and profiling become a more common feature of criminal investigations.¹⁷ This being the case, the obligation on the prosecution in particular to ensure a transparent and accessible presentation of the evidence will be made clear.

What is difficult about managing DNA evidence in criminal trials?

The use of DNA evidence in criminal trials across Australia is still in its infancy.¹⁸ British and American court practice has a deeper grounding in this area, but still it might be viewed as a relative novelty. In cases such as the English Court of Appeal decision of *R v Dohemy & Adams*, the Court recognised the overwhelming importance of forensic evidence such as DNA, particularly in cases where the prosecution rests on an aggregation of circumstantial evidence. In making this observation, the court recognised the difficulties inherent in explaining to juries the significance of such forensic evidence. These difficulties are a natural product of the manner in which DNA evidence is contested. Having now gone beyond the battle over the science used,¹⁹ the next issue is the need to explain what DNA analysis really means and what it contributes to the case.²⁰

The cogency of the DNA makes it particularly important that DNA testing is rigorously conducted so as to obviate the risk of error in the laboratory, that the method of DNA analysis and the basis of subsequent statistical calculation should — so far as possible — be transparent to the defence and that the true import of the resultant conclusion is accurately and fairly explained to the jury.²¹

From our trial observations,²² particular difficulties with presenting and understanding DNA evidence seem to recur. In our experience they can be classified under the following headings:

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- 17 One of the arguments in NSW favouring the establishment of an independent analytical facility has been the recent growth in workload, attached to the concern from defence lawyers about separate access to opinion and analysis.
 - 18 The review report presents a summary of Australian case law in the area.
 - 19 This was confirmed by the opinions of defence lawyers participating in the review's focus group sessions.
 - 20 In several trials observed by the review, judges were at pains to instruct their juries that DNA evidence was just another component of a circumstantial case. Our survey results, however, confirmed that jurors anticipated and confirmed that DNA evidence was significantly persuasive.
 - 21 *R v Dohemy & Adams* [1996] EWCA Crim 728 (31 July 1996).
 - 22 These have been augmented with trial narrative analyses of previous cases in which DNA has featured.

1. 'White coat syndrome' — where the evidence can only be disentangled by expert witnesses, and the contest between experts in disagreement gives the foundation for a dispute between the prosecution and the defence. Juries have particular difficulty reconciling the respect for expert opinion with contested expert evidence and challenges to expertise.²³ This confusion may become a context in which the consideration of the opinion and its subject matter is further confused. It is one thing to suggest that expert evidence on DNA is confusing per se. However, challenges to expertise appear to add significantly to the confusion of jurors.

2. Difficulties of language — the presentation of evidence concerning Deoxyribo Nucleic Acid (DNA) requires demystification of a language of science unfamiliar to lawyers and to juries in particular. In addition, the language of analysis expects the lawyer and the juror to venture into the specialist and foreign realm of genetics and statistics, which in its clearest representation can be confusing. A central focus of confusion is the relevance of the probability ratio that DNA analysis provides, and its translation into evidence of identification (see *R v Gali* [2001] NSWCCA 504). It would appear from our juror insights that because DNA evidence is presented as a statistical ratio (outcome of analysis), and as a physical exhibit (the material from which the sample was taken), confusion exists about what DNA evidence actually is, and its contribution to a circumstantial case in particular. The argument as to its significance may be exacerbated by this confusion, particularly when it comprises a part of a circumstantial case. Our juror surveys confirmed that a majority of jurors approach the trial with high expectations for the significance of DNA evidence. This may be based more on popular culture rather than scientific understanding. Such disproportionate expectations can produce frustration with the emergence of trial evidence but overall did not significantly diminish the jurors' belief in the probative importance of DNA.

3. Levels of legal/scientific authority — the analysis of DNA evidence in court rests on the expression of expert opinion. The authority of that opinion is established and challenged in a variety of different ways. Once settled, the expert then needs to persuade the juror that his or her science has authority. Along with this, lawyers and judges have to invest the contested evidence with legal relevance, evidentiary significance and contextual interpretation. The traditional tensions between law and science, particularly as they relate to processes of analysis, tend to evidence a divide between the expert's vision of DNA and the lawyers evaluation of its relevance. This in turn holds further potential for juror confusion when they are asked to arbitrate what is fact from opinion.²⁴ In addition, our survey results indicated that jurors may be confused by the manner in which the lawyers presented and argued the DNA evidence, and the reasons for its inclusion. However, generally they expressed confidence in understanding scientific notions such as a 'profile match'.

4. Professional alliances — lawyers and experts in criminal trials demonstrate professional alliances (no matter how strained or conflictual). These alliances can often exclude lay participants in a trial, and exacerbate status structures that govern the way jurors believe they should be influenced by evidence and opinion (Bell 2003). In so doing, the nature and language of the professional alliance presents a tendency, even in the least adversarial context, to alienate the lay juror from what is being communi-

23 This is not unique to expert commentary on DNA. Contested expert evidence in general tends to confuse the understanding of juries — see, Young 1999.

24 One trial observed by the review was preceded by an extensive voir dire which in part determined a defence challenge against DNA evidence as being opinion evidence.

cated. Jurors will, in our experience, turn off when the lawyer and the expert are debating the intricacies of DNA analysis. Our survey results suggest that this may not impede an ultimate understanding of the essential nature of the evidence in dispute, but could confuse its significance relative to other forms of evidence.

5. *The novelty of forensic evidence and its analysis* — as we have suggested earlier, DNA as an identifier in a criminal trial is relatively new. Even against the background of its high profile in crime and justice popular culture, DNA evidence will be unfamiliar to most lawyers and jurors for some time to come.²⁵ Unlike fingerprint evidence and many other of the more conventional forensic styles, DNA offers up new challenges in comprehension, the reward being greater levels of significance accorded to such evidence by lawyers and jurors. The novelty of the evidence and the expert opinion it requires means that there is an absence of well-established authorities or conventions on the appropriate way of delivering this evidence and its challenges. As with the prosecutor's fallacy (see, *R v GK* [2001] NSWCCA 413; *R v Keir* [2002] NSWCCA 30), it appears that such conventions emerge as much out of mistake and confusion in dealing with the evidence.

6. *The forensic intention for DNA* — an oft quoted justification for DNA analysis in criminal justice is that it has the potential to exclude the innocent from prosecution or conviction, and to exonerate the innocent. Our survey results indicated that a significant number of jurors were not sure why a DNA sample had been taken in the first place. However, the trend as we observed it is to incorporate DNA as an essential feature of certain prosecution cases (Briody 2002). If DNA is to be the compelling evidence, and to possess the potential for a 'knockout blow' when compared with other material evidence, then its positioning within the trial bears greater importance than other evidence on which it may crucially rely. The tendency to present DNA as most compelling attaches to it (and its presentation as evidence), we would suggest, unique issues of responsibility for lawyers in its management.

Furthermore, the jurors' expectations about DNA evidence and its bearing on their task are compounded through media representations of DNA as conclusive proof of a person's guilt. This highlights some of the inherent difficulties confronting the responsible management of the representation and understanding of DNA evidence within the confines of a criminal trial.

It is not the common pre-existing familiarity with DNA as a test for guilt or innocence that necessarily drives trial outcomes. For instance, some jurors surveyed indicated a knowledge of DNA and an expectation that it would be significant in determining guilt or innocence, but were confused at trial regarding its presentation, and were unsure about the weight to accord forensic evidence relative to other evidence in the trial. Arguably it should be the differential reception of trial argument about DNA evidence that is a reason for the approval rating we received in one of the jury surveys. One could assume that if counsel's presentation of the evidence was clear, that there was little about DNA that was contested, and the expert opinion was presented in a cooperative and complementary fashion, jurors would be more likely to be comfortable with forensic evidence and its significance. In several trials where some or most of these conditions featured, such comprehension measures followed and approval measures of the evidence and its presentation were high. In other trials it, was clear that adversarial presentation and the testing of expert evidence

25 In saying this, we are not challenging the majority of survey respondents who indicated a 'pre-existing awareness' of DNA. A 'pre-existing awareness' of this kind does not necessarily equate to personal or detailed knowledge of what later would be presented as evidence.

may have made comprehension more difficult. It is not easy with a small sample of trials to be conclusive on this but we are inclined to speculate that it is not contested presentation and opinion alone that poses difficulties for jurors. Rather, it might be the manner of such contest and the way in which opinion is attacked that has a capacity to confuse.

Our survey responses confirm a strong pre-existing prejudice about DNA and its power over guilt, but expose a divide through trial experience as to whether in fact it confirms guilt. This in turn suggests a responsibility on counsel to manage prejudice and employ it, or turn it around towards their preferred conclusions. It places lawyers in the unenviable role of presenting evidence beyond the ordinary purview of the law itself to jurors who have already formed often incorrect ideas about its meaning and potential impact. Whilst such a dilemma is hardly unique to practice, it is particularly onerous given the declared compelling nature of the evidence itself, or how it is argued for as such, and its striking capacity to influence verdicts either way. This duty on behalf of lawyers is magnified by the potential for DNA evidence to be conveniently employed by investigators to shore up their cases in questionable circumstances. Prosecutors, for instance, may be privy to police sampling processes, the integrity of which would be unlikely to come into question unless the prosecutor tested its foundation as part of the proofs of the brief.

Matters to enhance the accessibility and transparency of DNA evidence

Issues that would enhance the accessibility and transparency of DNA evidence in trials include:

a) Disclosure: For NSW, the requirement for disclosure in the prosecution of criminal cases is set out in a myriad of documents including the Prosecution Guidelines and Prosecution Policy of the DPP, as well as the New South Wales Barristers' Rules and the Law Society of New South Wales Solicitors' Rules. The prosecution is placed under a prevailing obligation to make full disclosure to the accused of all facts and circumstances and the identity of all witnesses reasonably to be regarded as relevant to any issue likely to arise at trial.²⁶ Regarding DNA evidence specifically, convenient and comprehensive disclosure by the prosecution is of the utmost importance in order to provide the defence with every opportunity to prepare and develop a case using what is still relatively novel, potentially prejudicial and often extremely complex scientific evidence. In addition, in jurisdictions where expert resources are limited and often committed, the need to go further afield in order to address the prosecution case at that level is an additional reason for early disclosure in the interests of a fair trial. Some prosecutors have also suggested that obligations for convenient disclosure recently required of the defence were not readily complied with where overseas defence experts were engaged.

It was revealed before the review that disclosure has some particular complications when it comes to forensic procedures. Prosecutors at a review focus group were surprised at the revelation by defence advocates that the laboratory was only providing them with limited and late access to analytical reports in certain cases. It was the general view that disclosure of scientific information on which the prosecution case relied should be complete and convenient, and certainly not governed by unaccountable laboratory protocols.

26 NSW DPP Prosecution Guidelines: <<http://www.odpp.nsw.gov.au/PolicyGuidelinesGuidelines.html#11.%20Disclosure>> (7 February 2003).

b) Pre-trial hearings: It is not uncommon for complex criminal trials to feature pre-trial hearings. With forensic evidence such as DNA recognised as having a potential for complexity, pre-trial or voir dire hearings to test the detail of essential defence arguments, to interrogate expert witness testimony for signs of common ground or division, and to reach compromise on the presentation of evidence, appears in our experience to be productive.

c) Agreed evidence forms: Arising from pre-hearings and other mechanisms for agreed facts, is the possibility to establish conventions about the form and content for the presentation of forensic evidence. Arguments in favour of such common or model tools for presentation mirror those that argue for standard judicial directions in the field. Particularly when it comes to introducing the less-contested language and mechanisms of the science, expert evidence can be made more effective and far less confusing in an agreed template form. As we have said earlier, through evidentiary conventions where the issues in dispute become more focused and selective, both sides of the case have an arguably greater opportunity to influence the jury towards their interpretation of the science.²⁷

d) Court-appointed experts: There is considerable and appreciable reservation about the suggestion that the ‘court-appointed expert’ regime now common in certain civil jurisdictions should be adopted in criminal trials. In the case of forensic evidence in Australia, where the state laboratories are not uniform and the available pool of local expertise is small, predictable and over-exposed, there might be a stronger argument to experiment with such a system. This should not be viewed as an invitation to deny legitimate contestation through shared experts. Rather, it recognises the problems which exist with contested evidence, and defence tactics in particular which rely on the confusion of the jury or the destruction of expert’s credibility.

The institutional bias and associations of expert witnesses in a small scientific community is something that is addressed to some extent through the court appointed expert model. It also may be a way of containing spiralling costs in using international experts through the depersonalised medium of video-link.

Challenging DNA

The observations of trials in the review have suggested a development away from the early forms of challenge to DNA evidence in Australian criminal trials. Initial defence attacks on DNA were mounted against the scientific credibility of the ‘profiler plus’ profiling science. Attached to this were more specific criticisms of the manner in which DNA evidence was sampled, matched, analysed and reported on, as well as more particularist criticisms of the laboratory processes involved. Occasionally such challenges will be returned to, but the defence response to DNA evidence now takes on new forms.

1. Challenging the mixture:

Even if one is to accept the overall reliability of DNA profiling, a ‘match’ alone — without more — is not itself conclusive of an individual’s guilt. Again we must return to that important base question: ‘What does a match mean?’ In the case of DNA mixtures a ‘match’ can be used by the defence to posit an alternative argument of how an offence was committed and by whom.

²⁷ In regard to this issue, it is important to remember the empirical evidence that challenges the simple assumption that confused jurors are more likely to acquit (see, Findlay 1994).

We recently observed a case that involved evidence of a DNA mixture that had been extracted from a crime stain. It was said that this mixture comprised the DNA of the accused and his girlfriend as major contributors, in addition to an unknown minor contributor. The defence challenged the prosecution's interpretation of this evidence both factually and scientifically. Factually, the DNA evidence was used by the defence to support the thesis that the unknown minor contributor was in fact responsible for the crime in question. Scientifically, conflicting interpretations by the experts as to the results obtained were said by the defence to undermine both the veracity and credibility of the DNA evidence as a whole.

2. *Enhancing DNA evidence:*

Mixture samples is an area where the science of DNA analysis invites strenuous challenge. Like the profiling of samples from suspects out of small particularist communities, the reference sample to be employed may have a crucial, and potentially distorting influence, on the resultant probability ratio.

There are at least two choices for the defence when confronted by juror bias towards the compellability of DNA evidence and its confirmation through incredibly high probability ratios: either attack DNA analysis and what it says, or further legitimate its impact for your argument by celebrating the science and expressing frustration at its outcome. The latter approach should enable the defence to incorporate into its position juror confidence about DNA while at the same time casting doubt on why its potential was not fully achieved. Also, and with mixed samples in particular, the defence could deflect the attention of the jury onto the unknown contributor, or why complete identification of crime scene participants was not possible.

3. *Challenging the probability ratio and its representation:*

In addition to asking, 'What does a match mean?' there remains the important question of how the significance of a match is to be calculated. How do we arrive at the 'match probability': that is, the probability that a randomly selected, unknown, unrelated person would have the same DNA profile as the suspect? The difficulty here is that there are a myriad of ways of arriving at the 'match probability' and the method chosen in the individual case — according to one commentator:

must be seen to be as much a matter of opinion as one given in other areas of forensic science. [In this way] ... the match probability is personal. It is based on what the scientist considers to be the most appropriate calculation given the circumstances of the case (NSW Legislative Council 2002:27).

In the absence of any consensus concerning the most effective means of calculating the probability of a coincidental match, evidence of this nature remains vulnerable to attack by defence counsel.

This is perhaps most clearly demonstrated in the debate concerning whether match probabilities should be calculated according to the different frequency of alleles within particular racial subgroups.²⁸ Again, there has been no resolution to this debate and the

²⁸ See *R v To* [2002] NSWCCA 247 where one of the grounds of appeal was that her Honour had erred in admitting evidence of the DNA analysis. The first submission on appeal was that the use by Mr Goetz of Chinese databases failed to comply with what was said by Hunt CJ at CL in *R v Pantoja* (1996) 88 A Crim R 554. In that appeal the complaint was that the appellant was of a peculiar racial extraction and that the evidence did not establish whether the database used contained results of tests of DNA of persons of that extraction.

courts have attempted to grapple with this issue in determining the validity of the databases used and the calculation methods employed (see, *R v To*; *R v Pantoja*). Another related issue is whether relatives should be factored in to the calculation of chance match statistics. The reason for this is that relatives are far more likely to have a matching profile and their inclusion might significantly impact upon the result obtained in any given case. Indeed, it has been noted elsewhere that '[t]he current practice of ignoring close relatives, unless there are good reasons to suspect them, will often greatly overstate the weight of DNA evidence' (NSW Legislative Council 2002:31).

So now, given the difficulties that we have identified in calculating the probability ratio, what then are we to make of its representation to a jury?

Chance or coincidental matches of profiles, while very unlikely, cannot be claimed to be impossible. In this way, the significance of a DNA match between a suspect and a crime scene is interpreted through the calculation of the likelihood of a chance match. The lack of consensus on how the most effective means of calculating the probability of a coincidental match compounds the difficulty of directing the jury appropriately. (See f/n 23)

4. Challenging DNA evidence as opinion:

In a recent case in NSW, the defence originally advanced a challenge to forensic expert evidence as opinion. The response to this might be that all expert evidence essentially rests on scientific opinion, and therefore, what is different about the representation and analysis of DNA? In support of the opinion evidence critique, the defence suggested that particularly in the analysis of mixture samples, both the methodology of referencing and the interpretation of results was so dependant on the particular opinion of the expert that the authority of the evidence needed to be seen in such terms. The challenge to the evidence was proposed beyond the simple presentation of competing or contradictory expert opinion, but rather that all opinion in this context required cautious acceptance.

5. Challenging the chain of custody:

In the NSW authority of *R v Sing*²⁹, challenges to the 'chain of custody' in the process of sampling and analysis were examined. Basically this challenge is structured around the assumption that for a DNA analysis to have integrity, each stage of the analytical process requires identification, and each person associated with that stage must be made available for examination at trial. The logistical difficulties of this are obvious. In addition, the forensic relevance of such an approach is problematic bearing in mind the number of hands through which the sample may pass and the limited particular familiarity with the sample of each analyst beyond routines and protocols.

Because of the mechanical or technocratic nature of this challenge, consideration has been given to the formulation and introduction of legislative deeming provisions to cover the custody chain in much the same way as those that apply to traffic speed readings. The justification for such a radical evidentiary compromise in this instance rests more with pressure on limited scientific resources than it does probative impediments with meeting the challenge itself.

6. *Challenging consistency and credibility of analytical protocols:*

In DNA cases where mixtures are analysed in particular, the nature of the reference sample used is sometimes problematic. For instance, there is scientific criticism of comparing a sample found at the scene, with the sample from the suspect, without reflecting both these independently to a more general population of profiles. The Standing Committee report recommended against such practices proliferating in NSW, and the police have countered with the argument that the delay involved in blind database sampling may mean that suspects cannot be charged early enough in the investigation process. We take the view that there should be no substantial difference in the time taken for sample preparation and sample-to-sample profile testing than that involved in profile blind matching. Similar concerns have been raised with reference back to particular ethnic or racial population databases.

When the forensic laboratory is financed by, or responsible to, the police, then the independence and accountability beyond the prosecutor as the major client may be in question. In such situations, it is not only the objectivity of lab protocols that may be less than apparent, but there are also real issues regarding the need for equity in access (Crime and Misconduct Commission 2002:20–21).

Future trends in the presentation and challenging of DNA evidence

The review was taken by the importance of an integrated approach for managing forensic procedures within the criminal justice process. Specifically, in order to achieve harmony in this field of evidence delivery, a best practice strategy was explored that involves a more interactive approach than that offered by legislative regulation alone. The impressions we gained from players within the trial process in particular tended to confirm that the power of DNA needs to be confronted and interpreted through a range of best practice strategies that serve to influence the investigation, analysis, recording and adjudication stages of forensic procedures.

Against this context there are a range of developments in forensic procedures that will impact on the immediate future application of DNA evidence within criminal trials:

• DNA more significant in investigation

With the advent of technological advances in this field, we have seen a heightened reliance on DNA evidence in the investigation, as well as the prosecution, of criminal offences. There is no reason to believe that this will subside at any time in the foreseeable future. Indeed, we foreshadow the possibility that with the ever-greater reliance placed upon DNA evidence by the police and the prosecution, there comes the very real risk that evidence of this kind may be fabricated or tampered with in order to meet burgeoning expectations.

Particularly with reference to rape (sexual assault), DNA evidence is becoming the pathway to conviction. The power of DNA as an identifier in these sorts of offences is now significant. During the period of the review public pressure emerged for a liberalisation of the rules regarding similar fact evidence where DNA identifiers on their own did not prove conclusive of liability. However, the growing expectation that rape is identified most strongly through DNA evidence does a disservice to the definitional scope of sexual assault, and promotes the misunderstanding that without DNA, other indicators of assault become problematic. Reforms in the law regarding sexual assault

have recently attempted to emphasise the assault component in these offences as well as endeavouring to move away from a narrow conception of rape. Semen sampling as a core of sexual assault proofs turns the clock back on this, if sexual assault becomes unduly reliant on DNA matches to confirm the assault.

In addition, the use of DNA evidence in sexual assault trials demonstrates how some unexpected and unfortunate consequences may arise for victims. It would be fair to assume that the better identification of perpetrators through the use of DNA would benefit the victim's cause and make women more confident to report sexual assault. However, what seems to be happening in practice is that radically higher sentencing ranges in NSW for sexual assault is discouraging offenders to take the discount available through an early guilty plea. Also, while DNA removes the possibility of a defence that the accused was not involved in the sexual encounter, consent is now more likely to be contested. This has the consequence of requiring more from the victim as a witness at trial, and may therefore discourage reporting in the medium term.

- **DNA evidence and agreed facts**

Whilst it is acknowledged that agreement between the prosecution and the defence as to a common approach concerning the presentation of DNA evidence has the potential to enhance, and indeed facilitate, a jury's understanding of complex scientific evidence, caution, however, must still be exercised.

Specifically, the development of any such relationship between prosecution and defence counsel has the potential to foster a familiarity that could render both parties complacent about the science itself, as well as its contestability, a trend that now is more prevalent.

- **Deeming provisions concerning expert protocol**

The development and introduction of deeming provisions has the advantage of introducing some credibility in the synthesis of some of the more contentious aspects of DNA profiling and analysis. It may also relieve pressure in part on limited scientific resources. However, any such standardisation process risks insulating 'experts' from defence challenges concerning, for example, sample contamination or the calculation of the match probability ratio. Put simply, the need for certainty and uniformity must be weighed up against the fact that standardisation itself may remain inherently problematic.

- **Census population testing, the widening of thresholds, and the problematic position of 'volunteers'**

It is true to say that DNA dragnets may be used for exculpatory purposes. However, this purpose cannot be seen in isolation from the very real challenge such investigative 'tools' pose to the fundamental tenets of our criminal justice system; for example to the presumption of innocence. This erosion of rights is perhaps most clearly evidenced in the recent cases of mass testing in Wee Waa and Norfolk Island, where non-compliance became not so much an exercise of choice but rather an act equated with the inference of guilt. Arguably, this is best characterised by the familiar question heralded in media reports of that time: 'Why wouldn't he give a sample, if he has nothing to hide?' There has been enough challenge to the reality of informed consent within forensic procedures (NSW Legislative Council 2002:chap 5) without the added strain concerned with the actuality of volition in mass-testing situations.

- **An independent laboratory**

Calls for the establishment of an independent laboratory are premised on a number of concerns, in particular, ensuring equity of access to, as well as the impartiality of, DNA analysis. However, caution remains as to the inherent problems associated with a small pool of experts and a prevailing confusion concerning the identification of the client.

- **Cross-jurisdictional data sharing**

This is an issue that has received some attention of late concerning a suspect to the murder of Peter Falconio (the British back-packer who was feared murdered in the out-back of the Northern Territory). Obviously, the advantage of devising a system whereby DNA profiles may be shared between and among jurisdictions carries with it the potential to enhance the ability of the police to investigate crime on a national level: that is, to use DNA evidence to both exculpate as well as incriminate a suspect. However, challenges may arise as to the best way of maintaining the integrity of any such national system. For example, how could compliance with the legislative destruction provisions of DNA samples in one jurisdiction be ensured in another, or where the national database works on different protocols and legislative requirements from state and territory providers?

Problems caused by a lack of uniformity across Australia in the legislation and practice governing forensic procedures have given opportunities for critics to suggest that in the context of data collection, maintenance and dissemination, the lowest common denominator will prevail (Gans 2002).

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