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An Introduction to the Admissibility of Expert Scientific Opinion

1.1 Admissibility, Reliability and Scientific Evidence

The investigative and legal processes, from the discovery of a crime to the verdict of the court, should ultimately ensure that the guilty person is correctly identified and that the innocent are exonerated. However, in many cases, the complexity, both of these processes and of the contributions to the debate, may lead to difficulties and challenges that act to impede and divert both scientific and legal arguments and which may lead to an unsatisfactory outcome. This book is concerned principally with the contribution of scientific evidence to legal debate. Central to this is an understanding of how the scientist’s findings can be properly interpreted, evaluated and communicated to the court and how the court draws appropriate inferences from the expert opinion in reaching its decision on the ultimate issue. In doing so, the court must necessarily be satisfied that the science is valid and the evidence relevant to its deliberations.

Although the concept of relevance has been enshrined in law across most jurisdictions for many years, in more recent times a debate has emerged across wider aspects of the presentation of scientific evidence to the court and the role of the scientist as an expert witness. There are many reasons for this, which include significant advances in scientific techniques, the need for investigators to deal with more complex and high-profile crimes, increasing attention to these concerns and the ongoing responses of the legal profession and lawmakers to those events. The chapters in the first part of this book are intended to describe and discuss these aspects in detail across several jurisdictions.

As a precursor to this, it will be helpful to outline some of the key issues that mark out the path of this later discussion.
The law provides for an expert witness to contribute both factual and opinion evidence to the court. Within the legal system, the judge is empowered to decide on whether any evidence is relevant to the case being debated. However, there is some diversification of rules and practice, which, in many jurisdictions, is largely driven by case law where so-called landmark judgments by courts of appeal clarify points of law, which then apply to subsequent cases. In this way, across Anglo-American and related jurisdictions in particular, the law governing the handling of scientific evidence by the courts has evolved, and continues to evolve, punctuated by changes to the law at a national level and other relevant activities by governments and agencies.

Over the past thirty years or so, concerns around scientific evidence in the court have focused on three main issues:

1. Is the evidence admissible to the court?
   Admissibility includes whether the evidence is relevant to and therefore has value for the legal debate (probative value), as well as a variety of other factors such as the status of the expert witness, the quality of the methodology and the underpinning science. Admissibility is determined by the judge and is categorical, since the expert witness will either be permitted or not permitted to give their testimony. The judge is said, by some legal authorities, to act as a ‘gatekeeper’ for expert evidence. The judge’s decision on admissibility and the grounds for that conclusion is crucial to the legal process.

2. Is the evidence reliable?
   Reliability may contribute to admissibility but is itself a complex concept which is subject to considerable variation in how it is dealt with across courts and jurisdictions. At a basic level, the court has to assess the validity of the scientific methodology and whether the evaluation delivered by the expert is soundly based on the results of their work. However, the extent to which this contributes to admissibility or whether reliability may instead be a factor in deciding the legal weight of the evidence is open to debate. Therefore, it is the degree of reliability and not necessarily whether evidence is reliable or unreliable that matters. The significance of these two factors has been summarised by Susan Haack in the phrase:

   ‘Admissibility is categorical, reliability is continuous’

   [Haack, quoted in Cole, 2007]

3. Has the significance of the evidence been properly assessed, then communicated to and understood by, the court?
   It is the responsibility of the scientist to design and carry out experimental measurements, to analyse results and then to interpret what they mean in the context and circumstances of the case. However, as an expert witness, the interpretation of this work must be presented to the court so that the judge, the jury and the legal professionals may fully understand its significance to their debate. The extent to which this may be achieved and the manner in which it is done varies hugely across the subdisciplines of forensic science, between individual scientists and across courts and jurisdictions. The process of the evaluation and presentation of scientific evidence forms the discussion in the main section of this book.

Given that expert evidence, as we understand it, has been delivered to the courts for around two hundred years, why has the debate over admissibility, reliability and the quality of
scientific opinion come to the fore with such an intensity in more recent times? In the mid-Victorian period, scientific expert witnesses were often pitted against each other in the courtroom. Such public displays of warring experts tended to dent the reputations both of science for objectivity and of the scientists themselves as impartial seekers of truth. The situation was somewhat mitigated in the first part of the twentieth century with the professionalisation of forensic science and the consolidation of much expertise into regional and national laboratories. The situation began to change from the 1970s onwards, with increasing criticisms of ‘junk science’, particularly in the United States, where scientists were held to be influenced by the interests of the big corporations that had hired them and by the continuing stream of miscarriages of justice where forensic science and forensic scientists were seen as significant contributors to the problem.

It is convenient and informative to begin this discussion with cases where the legal process has clearly broken down and miscarriages of justice have taken place. Though such events cannot be laid at the door of any single cause, the impact of DNA profiling has probably had a greater significance than any other factor in bringing these to light and so that shall be our starting point.

### 1.2 The Impact of the DNA Revolution

The conviction of Colin Pitchfork in 1988 for the rape and murder of Lynda Mann and Dawn Ashworth can rightly claim to be the first case where DNA profile evidence was key to a successful prosecution. However, this should not overshadow a second milestone achieved through this investigation. The reason the police initially approached Alec Jeffreys at Leicester University, with a view to trying out his new DNA identification technique, was that they had obtained a confession to one of these murders from a different man, Richard Buckland, and were looking for scientific proof of his involvement in the second case, which Buckland denied. When the analysis revealed that Buckland was not the source of the semen sample from either crime, this revolutionary technique prevented a potential miscarriage of justice. The impact of DNA profile evidence when it contradicted and quashed, not only other forensic evidence, but also witness testimony and suspect confessions, was to provide an impetus for challenges to wrongful convictions that would endure for the next thirty years.

However, DNA was to initiate a deeper and more subtle revolution, both in the paradigm of forensic identification sciences and, more particularly, in the evaluation of forensic evidence and its contribution to legal debate (Saks and Koehler, 2005). For just over a hundred years, fingerprint evidence had been the gold standard against which other forensic techniques were measured and, as an identifier of individuals, the fingerprint was unchallenged by the courts. Not only was it accepted that fingerprints were unique, but both legal professionals and lay people working in the courts had a general appreciation of the process of identification and trusted the word of the fingerprint examiner as an expert witness who stated that a crime scene mark matched a fingerprint taken from a suspect. By providing such categorical testimony, the fingerprint ranked above all other forensic evidence in the court.

Once the DNA profile arrived on the scene, as rival to the fingerprint, it is easy to see why the term ‘DNA fingerprint’ became fashionable, as the new technique sought to
promote its apparent infallibility. However, DNA testimony did more than just state a match between two profiles, it was supported by an additional statement on the rarity of the profile within the relevant population and, unlike the uniqueness claim from the fingerprint expert, this was underpinned by rigorous scientific research in the field of population genetics. Thus, DNA was perceived as objective and scientific while the interpretation of fingerprints, for the most part, depended on subjective criteria, implemented according to the judgement and experience of the individual examiner. Over the following ten years or so, the DNA profile, with its strong scientific basis, became established as the new standard while fingerprinting, and indeed many other techniques within forensic science came under increasing scrutiny as their scientific foundation, validity and reliability became questioned by the legal profession, by many scientists and indeed by governments and their agencies. Consequently, the concept of a 'DNA fingerprint' fell into disuse and the 'DNA profile' became the accepted term. In addition, the onus fell on other forensic methods to provide statistical support to strengthen their statements of scientific opinion, thereby enhancing their quality in order to attempt to meet that of the new biometric. As this is easier for some types of evidence, for example, glass or footwear marks, than others, such as bite-marks, challenges to the validity and reliability of various types of evidence became increasingly common.

The arrival of the DNA profile in the courts has also led to a more critical appraisal of the wording of expert testimony and the use of terms such as 'match', in particular. This, and similar expressions, had been used extensively for many forms of evidence, often without much thought as how that could be explained or justified in an objective manner. With the acceptance of the scientific basis underpinning the comparison of DNA profiles, it was apparent that, for many other forms of forensic evidence, the expert’s declaration of a match attached an exaggerated weight to its significance in the legal debate. This was particularly true in conveying the results of serological (blood grouping) tests and microscopic hair examinations which, although potentially providing useful class characteristics, had often been regarded by juries, and indeed by many forensic scientists, as strongly individualising and so the evidential value was frequently grossly overestimated by the court.

In summary, the implementation of DNA profiling within the forensic arena has contributed to the questioning of the value and legal significance of many other forms of scientific evidence and highlighted many instances of faulty interpretation or exaggerated opinion. Thus, there have been two revolutions in the discipline: first, the legal review of past convictions has led to the identification of miscarriages of justice – this will be examined in the following sections; and second, the scientific basis of much of forensic science has been questioned by the legal and scientific communities, as well as by governments. This will be the subject of the subsequent chapters.

1.3 The Miscarriage of Justice

Where the trial of an accused person leads to conviction, this may be overturned by a successful appeal to a higher court on a limited range of grounds, including procedural irregularities. On some occasions, other facts or evidence may come to light that lead to the sentence being quashed and, in some cases, this may not happen for many years and may
be initiated by legal and political mechanisms, as well as by the individuals themselves. In these cases, the original conviction may be termed a miscarriage of justice or wrongful conviction. In 2011, the England and Wales Supreme Court considered such events and declared that:

‘… a miscarriage of justice occurs “when a new or newly discovered fact shows conclusively that the evidence against a defendant has been so undermined that no conviction could possibly be based upon it”.’  

[R (Adams) v Secretary of State for Justice, 2011]

The Supreme Court also identified the circumstances whereby a conviction may be quashed. The first is where fresh evidence clearly shows the innocence of the defendant. Had this evidence been available at the trial, a ‘reasonable jury’ would either have not convicted the defendant or a conviction would have been in doubt. The second circumstance arises when the conduct of either the investigation or the trial was subject to serious error, thereby leading to an improper verdict.

Although miscarriages of justice from across the world have been recognised and studied over the past century, the reasons and circumstances under which they occur have been examined more intensively over the past thirty years or so. Although, as we shall see, faulty forensic science was sometimes responsible for such events, good forensic science, including the new methods for identifying individuals based on DNA profiles, has contributed immensely to the discovery and quashing of wrongful convictions. Particular circumstances in different countries have initiated and sustained surveys, studies and reports by academic researchers, legal professionals and government agencies on miscarriages of justice and these have provided not only an indication of the scale of these events, but also a converging picture of the range of causes that have given rise to their occurrence.

### 1.3.1 The United Kingdom

A series of serious bombing incidents on the British mainland, linked to the ‘Troubles’ in Northern Ireland, occurred from the 1970s onwards. The deaths of British soldiers and civilians which resulted from these terrorist incidents meant that the police were under significant public and political pressure to bring the perpetrators to justice. However, many of the subsequent convictions that followed were later overturned, either on appeal or after campaigns highlighting a miscarriage of justice, but not until those convicted had spent many years in prison. These include the cases of the Guildford Four (1974, freed 1989), the Birmingham Six (1975, freed 1991), the Maguire Seven (1976, freed 1991) and Judith Ward (1974, freed 1993). Following these exonerations, the Criminal Cases Review Commission (CCRC) was formed in 1995 as a body tasked with reviewing potential miscarriages of justice with a view to presenting them to the Court of Appeal. Nevertheless, in recent years, further examples of wrongful convictions, not linked to the Northern Ireland situation, have emerged, such as the cases of Sean Hodgson (1982, freed 2009) and Michael Shirley (1987, freed 2003), both of whom were exonerated by fresh DNA profile evidence, Stephen Downing (1974, freed 2002) whose second appeal was upheld on the grounds of an unreliable confession and a reappraisal of blood-spatter evidence and Barry George (2001, freed 2008) who was released after a reevaluation of trace gunshot residue evidence.
1.3.2 The United States

In the United States, the existence of the death penalty in many states gave an added importance to the prevention of wrongful convictions and raised public awareness of the scale of, and the reasons behind, miscarriages of justice, particularly for those on ‘death-row’. Some states set up innocence commissions to review cases, such as that of Governor Ryan in Illinois in 2000. In 1992, the Innocence Project was set up as a not-for-profit, legal organisation, initially as part of the Cardoza Law School, campaigning for the exoneration of those believed to have been wrongly convicted. It has accumulated a substantial amount of information on such cases that forms an invaluable resource for academic studies. Much later, in 2012, the University of Michigan Law School set up the National Registry of Exonerations that provides a database of all wrongful convictions in the United States since 1989. The statistics accumulated by these projects have enabled the full impact of DNA profile analysis to be appreciated as a means of identifying instances of wrongful conviction. These data have also contributed to highlighting a wide range of other major factors that have contributed to miscarriages of justice, ranging from the incompetence of police or forensic scientists, through to misidentification by witnesses.

1.3.3 Canada

In Canada, the unprecedented case of Steven Truscott was an early example of wrongful conviction. He was found guilty and originally sentenced to death in 1959, aged only 14, for sexual assault and murder, though this sentence was commuted to life imprisonment on appeal in 1960. He was freed in 1969 but only declared innocent of the crime when he was pardoned in 2007. Over the same period there were several other significant miscarriages of justice, most notably in cases involving the murder of a young girl: Donald Marshall (1971, inquiry report 1989), Thomas Sophonow (1981, inquiry report 2001), Guy Morin (1992, freed 1995, inquiry report 1998) and James Driskell (1991, freed 2005). These were each subject to a full public provincial inquiry, often many years later and, in all cases the report was not only highly critical of the investigative and legal process but also of the forensic examination of evidence and subsequent court testimony. These Canadian inquiries are highly regarded across the world for their thoroughness in looking beyond the facts of the case in question in order to identify systemic issues and failures in the justice system as a whole. Indeed, the Morin inquiry report has been described by Macfarlane as:

‘… arguably the most comprehensive judicial review that has ever been undertaken into the causes of wrongful conviction, and how to avoid them.’

[Macfarlane, 2006]

The Canadian approach to the investigation of miscarriages of justice has, more recently, gone beyond individual murder convictions. At least five individuals were wrongfully convicted of murder, based on the paediatric forensic pathology evidence provided by Dr Charles Smith. This was the subject of the Goudge Inquiry (2008) and will be discussed later in section 1.6.1.
1.3.4 Australia

The most publicised miscarriage of justice among Australian cases in recent decades is undoubtedly that of Alice Chamberlain (1982, exonerated 1987) who was convicted of the murder of her young daughter Azaria while the family were camping in the outback near Ayres Rock. As the mother claimed that her baby was carried away by a wild animal, this achieved notoriety as the ‘dingo baby’ case. Chamberlain was exonerated following a Royal Commission of inquiry (Morling Report, 1987) and an appeal hearing. However, it was not until 2012, following more recent cases where it was proved that a baby had been abducted by a dingo, that a coroner’s court ruled that this was, in fact, the legal cause of death of Azaria Chamberlain.

Over the next thirty years, further convictions in Australia became the subject of Royal Commissions and appeal hearings that frequently found faulty forensic science testimony had contributed to the subsequent miscarriage of justice. Most notable was the case of Edward Splatt whose conviction in 1978 for murder was based on a range of circumstantial trace evidence associating him with the murder scene. Two subsequent inquiries (Moran, 1981 and Shannon, 1984) were strongly critical of the forensic services within South Australia and Splatt was finally released in 1984. Recently, laboratory contamination was responsible for an erroneous result from DNA profile analysis that led to the conviction of Farah Jama for rape, solely on the basis of this evidence, in 2008. This contributed to ongoing reviews into the quality of DNA testing services within Victoria and New South Wales.

The Australian experience with miscarriages of justice led to a focus amongst stakeholders on the quality of forensic science and testimony both within individual states and at federal level, particularly after the Chamberlain and Splatt cases. Consequently, the National Institute of Forensic Science was established:

‘… to be an integral part of and a support base for the forensic science community, by working in partnership with all the elements of that community for the advancement of forensic science.’

[ANZPAA-NIFS, 2015]

1.4 DNA Reveals Wrongful Convictions

The high evidential value of a DNA profile, together with the ability to obtain, retrospectively, high-quality profiles from evidential materials many years after a crime had been committed, has led to a significant increase in the identification of wrongful convictions over the past twenty-five years. The first such case was that of Gary Dotson, convicted for rape in Illinois, United States in 1979, following misleading forensic testimony at the trial. As Dotson, the semen donor and the victim all belonged to the relatively unusual blood group B, serological analysis of a vaginal swab from the victim was, in fact, of no evidential value, despite the court being told of a blood group match with Dotson. In 1988, a DNA profile from the swab was found, not only to exclude Dotson, but further, to include the victim’s boyfriend as a potential source of the semen. Thus, the use of the new DNA technology provided evidence resulting in the exoneration of Dotson and his release from prison in 1989.
More recent exonerations have resulted in the release from prison of others who have been wrongly incarcerated for much longer periods of time. In December 1979, Teresa de Simone was raped and murdered in Southampton, United Kingdom. Sean Hodgson was tried and convicted of these offences in 1982 on the basis of a confession that he later retracted, on blood group evidence of limited evidential weight and on minor circumstantial evidence. At the trial, Hodgson admitted to being a ‘pathological liar’. In 1998, an attempt was made to re-open the case based on DNA analysis but the authorities claimed that the necessary exhibits had not been kept. Nevertheless, in 2009 the case was referred to the Appeal Court on the basis of fresh DNA profile evidence that revealed that Hodgson was not the donor of the semen samples taken from the body of the victim, and he was released after 27 years in prison.

DNA profile evidence continues to be a major contributor to the identification and exoneration of victims of miscarriage of justice across the globe. In the United States, in particular, such cases are monitored by the Innocence Project and other organisations. The statistics they provide are indicative, not only of the impact of such evidence on the legal process, but also of the ongoing scale of wrongful convictions by the courts and the consequent reduction in the public’s confidence with the legal system. For example, in the United States, of the 873 exonerations identified by the National Registry of Exonerations between 1989 to 2012, 325 were cleared at least in part by DNA evidence (Gross and Shaffer, 2012). The causes of these miscarriages of justice include not only faulty forensic science and testimony, but also a variety of other factors that will be reviewed next.

1.5 The Causes of Wrongful Conviction

The plethora of studies, inquiries and reports into cases of miscarriage of justice over the past thirty years or so from across the world have produced a remarkably consistent picture of the factors responsible. Although there is some variation in the significance of each factor across jurisdictions, the spectrum of failure, both within the criminal justice system and in the provision of forensic investigation and expert testimony, is evident throughout the world. Although the focus here must be on those factors rooted in the science, it is beneficial to summarise all areas at issue. Macfarlane (2006) has identified a set of ‘predisposing circumstances’ that provide a context for potential miscarriages of justice. These include cases that have a high profile with the public, leading to pressure to convict; cases where the defendant is unpopular, for whatever reason; a legal environment where the ethos is to ‘win the game’ whatever the evidence might imply; and cases where there is an over-riding belief in the guilt of the defendant and where a conviction must be obtained, even through improper practices. Within these contexts, there may be other, more specific factors within the criminal justice system that may lead directly to a wrongful conviction. Based on Macfarlane (2006) and others, these ‘immediate causes’ may be defined as:

1. Eyewitness misidentification; such evidence is generally unreliable since it relies on human perception skills and memory.
2. Police mishandling of the investigation; this includes a range of factors from incompetence and ineffectiveness through to professional misconduct, including police brutality, fabrication of evidence and nondisclosure. A significant factor here is the concept of
‘tunnel vision’ where police preconceptions about a crime act as the driver, so that the investigators attempt to use forensic science to confirm their suspicions, rather than to provide genuine leads to the investigation.

3. Poor communication between the forensic scientists and police or prosecutors is a systems failure that not only impedes the investigation, but may cause misinterpretation of the scientific evidence and misunderstanding of its implications and significance.

4. Inadequate training of criminal justice professionals may impact across many stages of the investigative and legal process.

5. Lack of forensic awareness by the police may lead to scientific evidence not being used effectively in the investigation, being misunderstood or being ignored. This often occurs due to insufficient or ineffective training and the absence of professional development.

6. There may be misconduct by the prosecution or relevant evidence may not be disclosed to the defence team.

7. If the prosecution case depends on informants who are in custody, have a criminal record or are incentivised in some way in order to provide testimony, such evidence is often unreliable.

8. Defence lawyers may be incompetent, represent their clients inadequately or indeed behave unprofessionally.

9. The prosecution case may rely on a false confession either through police tactics, mental health or other personality issues with the defendant or other circumstances.

10. Circumstantial evidence may have been misleading or misinterpreted.

In addition, there are other factors that relate specifically to unreliable scientific evidence and require more detailed discussion.

1.6 Unreliable Scientific Evidence

The causes of unreliable scientific evidence may either arise from a number of generic circumstances or, more specifically, from issues relating to a particular type of evidence.

1.6.1 The Status and Expertise of the Expert Witness

The expert witness may not be an expert or at least may not have expertise in the area of testimony. The status of the expert may have led the jury to accept the testimony uncritically. Within the field of forensic pathology, expert evidence is frequently given by experienced and, often renowned, medical practitioners and consultants who, however, may stray outside their area of expertise or indeed be unaware of, or be unwilling to admit to, the limitations of their knowledge. The often flawed testimony of Dr Charles Smith across many cases involving the deaths of children in Ontario from 1981 to 2001 led to up to twenty verdicts being reviewed in cases where parents had been convicted of murdering their young children, identified by Smith as shaken baby syndrome, but which were revealed as miscarriages of justice. The subsequent Gudge Inquiry (2008) into these cases stated:

‘Dr Smith is a pediatric pathologist, not a forensic pathologist. He has neither formal forensic pathology training nor board certification in that field’

Indeed, Smith told the inquiry that he did not regard forensic pathology as a separate discipline, though he had lectured and acquired an increasing reputation within that field throughout this period. Goudge concluded that not only did Smith not have a basic understanding of forensic pathology but that he was unaware of the damaging impact that could have on the validity of his expert testimony.

‘The expert must be aware of the limits of his or her expertise, stay within them, and not exaggerate them to the court. Dr Smith did not observe this fundamental rule.’


In the United Kingdom, Professor Sir Roy Meadow, an experienced paediatrician, provided testimony in the trial of Sally Clark in 1999 for the murder of her two young sons where the defence case was that both had died of Sudden Infant Death Syndrome (SIDS). However, he went significantly beyond his area of expertise when he quoted and then misused statistical data on the occurrence of this condition within the population at large. Indeed, his error was significant enough for the Royal Statistical Society to publish a statement highlighting it and warning of the danger of courts being misinformed on statistical matters by eminent experts who were nevertheless not qualified to do so. Clark was eventually freed, following a second appeal in 2003, mainly based on fresh medical evidence. The Clark case will be discussed in Chapter 19.2.

1.6.2 The Expert is not Impartial

In most cases where the expert is not impartial this means favouring the prosecution by highlighting those aspects of the testimony that support their arguments at the expense of alternative explanations. During the IRA bombing campaign on the British mainland in the 1970s, Judith Ward was convicted in 1974 on twelve counts of murder as a result of causing three separate explosions across the country. The evidence against her comprised alleged confessions, supported by forensic evidence that she had had personal contact with nitroglycerine and that traces of this explosive had also been found in a caravan in which she had been living. Ward denied having any involvement in handling explosives but she did not appeal at the time and it was only after her case had been referred to the Court of Appeal by the UK Home Secretary that she was exonerated of these crimes and freed in 1993. Crucially, the validity, reliability and interpretation of the results of chemical analysis on the residues from swabs, that were claimed to reveal nitroglycerine, were thoroughly investigated and criticised at this appeal. In particular, it was found that the scientists had suppressed experimental data which weakened the prosecution’s case by establishing that a dye in boot polish could provide a positive outcome to a test for this explosive. Other work into contamination by secondary transfer of these explosive traces which proved not to support the prosecution was also not revealed at the original trial. The appeal court judge found that the scientists had misled the court over contamination, not disclosed relevant scientific information and had abandoned neutrality in an attempt to support the police and the prosecution. This led to a serious miscarriage of justice.

‘It is the clear duty of government forensic scientists to assist in a neutral and impartial way in criminal investigations. They must act in the cause of justice… ’

[R v Ward, 1993]
1.6.3 The Evidence was Wrong

The police investigation into the murder of Marion Ross in Kilmarnock, Scotland, in 1997 effectively led to two miscarriages of justice, both based on the erroneous identification of finger-marks. David Asbury was convicted of the crime based on the presence of a finger-mark which was identified as from the victim, found on a tin containing money at his house. At his appeal, fresh evidence from fingerprint experts from outside Scotland revealed that this identification was incorrect and Ross was not in fact the source of the mark. Asbury was then exonerated and freed in 2000. What gave this case particular prominence, however, was that another finger-mark, found on the bathroom doorframe in the victim’s house, was identified as that of Shirley McKie, a police officer who had attended this murder scene. McKie, who consistently denied that she had ever entered the house or was the source of the mark, was tried for perjury in 1999. Once again, testimony external to the Scottish Criminal Records Office, this time from two American experts, succeeded in convincing the court of McKie’s innocence and that the original identification of the doorframe mark as her fingerprint, was wrong. The McKie case will be discussed in Chapter 13.6.

1.6.4 Exaggerated Evaluation by the Expert

The expert witness may have provided an exaggerated evaluation of the significance of the evidence. The physical comparison of hairs is amongst the most qualitative of the more established areas in forensic analysis and one where the interpretation and evaluation of the evidence depends almost entirely on the judgement and experience of the expert. The basis of hair examination is a process of comparison and classification, but rarely is there any data on the size of the class to which evidential hairs might belong, and no scientific underpinning of the resulting opinion. There have been examples of the expert claiming individuality and unique characteristics attributable to particular hair exhibits or quoting supposed statistical data in support of testimony. Indeed, more recently, the FBI reviewed past expert testimony on microscopic hair comparisons and found 90% of the reports contained erroneous statements.

Jimmy Ray Bromgard was wrongfully convicted in 1987 for the rape of a child in Montana, United States, finally being freed in 2002 when DNA profiling of stains on the victim’s underwear proved that he was not the source of the semen. The only evidence for the prosecution was a tentative eyewitness identification by the child and forensic examination of head and pubic hairs recovered from the victim’s bedding. The expert witness at the trial testified that these evidential hairs had:

‘… the same microscopic characteristics as the head and pubic hairs collected from Bromgard …’


He also claimed, without any statistical foundation whatsoever, that:

‘… there was a one in ten thousand chance that the hairs belonged to anyone other than Bromgard.’


In fact, it was later proved that the head hair came from the victim and that Bromgard could be excluded as the source of the pubic hair. The State crime laboratory was criticised for
failing to adequately train and supervise the hair examiner and Bromgard was paid substantial damages following his exoneration.

Guy Paul Morin was charged with the rape and murder of his next-door neighbour’s child, Christine Jessop, in 1984 in Ontario, Canada and initially acquitted. However he was re-tried and convicted, only being released in 1995 after more than ten years in prison, following the submission of fresh DNA profile evidence. The crucial evidence that was claimed to prove physical contact between Morin and the victim, was transferred hairs and fibres. The hairs were found to be microscopically similar to those from Morin and the interpretation of this was that the hairs ‘could have originated from him’ (Report of the Kaufman Commission, 1998). Amongst the many thousands of fibres found following tape-lifts were several that ‘could have’ come from the same source as reference fibres from Morin. The Royal Commission that investigated this miscarriage of justice criticised the scientist for exaggerating the evaluation of the hair evidence when initially communicating her findings to the police; this had initiated Morin’s arrest. The Commission’s report was critical of the use of phrases such as ‘consistent with’ and ‘match’ in the experts’ evaluation as they could potentially lead the court to misunderstand the forensic findings.

1.6.5 Unethical Behaviour

The testimony may have resulted from unethical behaviour or even have been fabricated by the expert witness. In 2004, Jacqueline Blake pleaded guilty to charges of misconduct in her professional duties as a forensic biologist with the FBI, as she had made false statements in her laboratory book in relation to many DNA profile analyses that she had carried out during 2001 and 2002. Specifically, she knowingly had not followed the FBI DNA Analysis Unit protocols by failing to process the negative controls and reagent blanks necessary to ensure the process was free from contamination when using capillary electrophoresis. Consequently, this resulted in virtually all her work being invalid. Although it was believed that no miscarriage of justice had resulted from her misconduct, the inability of the FBI quality assurance procedures to detect her behaviour significantly dented the credibility of the work of that laboratory.

The wrongful conviction of Glen Dale Woodall for double rape in 1987 was largely due to the testimony of Fred Zain who provided misleading and exaggerated serology evidence on the blood group of the donor of semen retrieved from the victims. Woodall was exonerated in 1992, after it was found that his conviction was only one of many that had relied on the evidence of Zain. Consequently, Zain was investigated for misconduct and incompetence and the report presented to the appeal court of West Virginia in 1993. This concluded that not only had Zain altered laboratory records, provided fraudulent reports and committed perjury on an extensive scale, but he had also gained a reputation for being unusually proactive in his support for the prosecution case in the courts over many years. He was indicted on multiple charges in 1994 but the jury could not reach a verdict and he died before a retrial could take place.

1.6.6 Human Error

The forensic analysis may have been subject to human error or have been carried out by inadequately trained personnel or without attention to accepted procedures and quality safeguards. The use of presumptive tests for explosives’ residues on the hands of suspects,
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featured strongly in cases arising from the IRA bombing campaign in the United Kingdom
in the 1970s. In particular, the results of the Griess test for nitroglycerine proved to be cru-
cial in the arrest and conviction of the Birmingham Six in 1975. These tests, which were
carried out in a makeshift fashion at Morecambe police station, claimed to prove that two
of the six men who were travelling to Ireland from Birmingham had had contact with this
explosive. Together with alleged confessions made while in police custody, this was the
principal evidence presented by the prosecution. It was eventually revealed that the scienc-
tist who performed the tests had not followed standard analytical procedures or run control
samples to check for contamination. Indeed, one of the arguments presented at the appeal
in 1991 was that, as the Griess test is not specific to nitroglycerine, the positive results
obtained may have been due to other chemical traces, including soap contamination of the
glassware, residues arising from smoking cigarettes or indeed from the suspects handling
playing cards over a period of several hours prior to the tests being performed. By neglect-
ing to implement proper quality assurance procedures, or to include appropriate control
tests, the scientist’s testimony contributed to a major miscarriage of justice, leading to
sixteen years’ imprisonment before all six men were exonerated of this crime.

1.6.7 Non-validated Methodology

The method itself or the science underpinning it may not have been validated by peers and
so have unknown probative value. Kim Ancona, a bartender, was found stabbed to death in
her place of work in Phoenix, Arizona, United States in December 1991. Although saliva
stains on her clothing were tested for blood group, no DNA profile was attempted at the
time, and the only forensic evidence was bite marks on her body. As it was believed that
Ray Krone had been helping the victim to lock up the nightclub that evening, he was
arrested when imprints of his irregular teeth revealed an apparent similarity to the marks on
the body. At his trial, two forensic odontologists both claimed, in their testimony, that
Krone had made the bite marks and, together with the fact that he shared a common blood
group with the source of the saliva stains, this comprised the totality of the evidence against
Krone. He was found guilty of murder and sentenced to death. However, after an appeal
and a second trial this sentence was commuted to life imprisonment. Eventually, after ten
years in prison, Krone was exonerated in 2002 when a DNA profile taken from the saliva
stain excluded him as a donor and, in fact, identified Kenneth Phillips, a convicted attacker,
as the source.

In a review of forensic odontology that predated Krone’s release (Pretty and Sweet,
2001), the absence of any rigorous scientific foundation to the analytical process or indeed
evidence of uniqueness in human dentition were identified as fundamental reasons for the
inaccuracy and unreliability of forensic bite-mark analysis. A few years later the NRC
report – Strengthening Forensic Science in the United States (2009) – re-iterated these
weaknesses when it identified bite-mark comparison as the most contentious topic in
forensic odontology.

1.6.8 Overconfidence in New Techniques

The confidence of the courts in DNA profile evidence became established through proven
techniques applied to cellular material of recognisable origin such as blood, semen or
body tissue. Once the amplification technology had succeeded in obtaining profiles from
samples invisible to the eye and containing very few cells, it did not follow that the
outcomes would sustain this confidence. The difficulties in the interpretation and evaluation of such new Low Copy Number (LCN) DNA evidence came to the fore in the trial of Sean Hoey for the murder of twenty-nine people, following a car bomb explosion in Omagh, Northern Ireland in August 1998. The key forensic evidence were LCN DNA profiles obtained from swabs taken from some of the bomb mechanism parts retrieved after the explosion. It was evident at the trial that the police, the forensic investigators and indeed the forensic laboratory staff were unaware of the enhanced precautions necessary to deal with control of the crime scene, to prevent contamination and to ensure continuity of evidence when working with potential LCN DNA materials. In his conclusion the trial judge declared that he was:

‘… not in the least satisfied in relation to any one of the items upon which reliance is sought to be placed for the results of their LCN DNA examinations that the integrity of any of those items prior to its examination for that purpose has been established by the evidence.’

[Queen v Hoey, 2007, paragraph 61]

Further, the defence and prosecution expert witnesses gave conflicting testimony on whether the core methodology underpinning the use of LCN DNA profiles as forensic evidence was, in fact, reliable, validated and indeed accepted by the scientific community beyond the United Kingdom, the Netherlands and New Zealand. Consequently, Hoey was acquitted on all charges against him. The Hoey case will be discussed further in Chapter 11.2.

### 1.7 The Scientist and the Laboratory

In addition to shortcomings in expert testimony, in techniques and in the competence of individual scientists, the operation and management of forensic laboratories overall has also contributed to miscarriages of justice. For example, the quality control procedures may have failed to prevent errors by the individual or to ensure their professional competency and, in some cases, such fundamental failures have brought into doubt forensic analyses carried out by a particular laboratory over an extended period of time. Where such systemic failures are suspected or identified, major reviews have often been carried out, such as those at the FBI laboratories on explosives-related cases in 1997, DNA analysis in 2004 and in the failure of fingerprint examination in the case of Brandon Mayfield in 2004. Other reviews have been related to doubts as to the fundamental validity of testimony based on specific techniques, previously promoted by a laboratory, such as the compositional analysis of bullet lead, which was discontinued by the FBI in 2005 following an extensive review and the use of the microscopic examination of hair evidence in 2015.

Failures by the forensic organisation itself are not restricted to the United States, however. In Canada, the Centre of Forensic Sciences (CFS) in Ontario was subjected to an investigation, following the successful appeal by Guy Morin in 1995, against his conviction for the murder of Christine Jessop. The Kaufman Inquiry established that the CFS had mishandled vital hair and fibre evidence that at the trial had played a crucial role in allegedly proving close contact between Morin and the victim. The report concluded that:

‘The contribution of the CFS to Mr. Morin’s wrongful arrest, prosecution and conviction was, indeed, substantial.’

Following allegations from a whistleblower, the storage and handling of drugs exhibits at the Victoria Police Forensic Services Centre in Australia was investigated in 2009. The report blamed the laboratory management for failing to ensure that staff followed appropriate policies and procedures, which in turn could impinge on the laboratory’s role within the criminal justice system. Elsewhere, the procedures for the examination of fingerprints across Scotland were scrutinised in 2011, following the miscarriage of justice in the case of Shirley McKie.

Nevertheless, ongoing difficulties persist in the United States right up to the present time, at both state and county laboratory level, where instances of malpractice and failure to ensure the competence, and indeed the integrity, of scientists have been reported. These have fuelled the calls for all forensic science laboratories to be regulated and subjected to appropriate accreditation, including decoupling them from the investigative authorities. This issue will be discussed further in Chapter 4.4.

1.8 Conclusions

This discussion has demonstrated that both the quality of the science and the quality assurance of the entire forensic process, from the crime scene to the court, underpin the admissibility, validity and effectiveness of expert opinion. Unfortunately, it has taken many instances of wrongful conviction to alert the criminal justice system to weaknesses and failures within the legal and forensic procedures, a process facilitated largely by the introduction of DNA profile analysis, some thirty years ago. To understand further the issues facing the scientist and the courts when considering expert testimony, we need to discuss, in detail, the admissibility of scientific evidence which is the subject of the following chapter.

References


Further Reading


R v Clark [2003] EWCA Crim 1020
R v R G (Sean) Hodgson [2009] EWCA Crim 490


