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DNA PROFILING AND THE FORENSIC USE OF DNA EVIDENCE IN CRIMINAL PROCEEDINGS

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Abstract

DNA testing has become an established part of criminal justice process, and the admissibility of the test results in the courtroom has become routine. There is not, and has never been, controversy about its ability to eliminate suspicion in cases where the suspect's DNA does not match the evidentiary sample. Debate continues, however, concerning the extent to which the guilt can be inferred when an apparent match occurs. In most cases, the best it can ever do is to place a suspect at the scene of the crime. However, the uncritical adoption of 'forensic biologic evidence' as the objective solution to the problem of determining criminal identity raises the possibility of 'scientific appropriation' of the criminal justice process and ignoring the fact that in most contested criminal cases, the crucial issue is not identity but of consent or mens rea, for which DNA evidence provides no assistance. This paper examines the current debate over the many roles that DNA can, and should, play in criminal justice system.

I Introduction

PERHAPS THE most significant advancement in criminal investigation since the advent of fingerprint identification is the use of DNA[1] technology to help convict criminals or eliminate persons as suspects. DNA analysis on saliva, skin tissue, blood, hair and semen can now be reliably used to

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1. DNA is an abbreviation of *deoxyribonucleic acid*. It is an organic substance which is found in every living cell and gives an individual a personal genetic blueprint. It can be extracted from a whole variety of different materials like blood, saliva, semen, hair, urine, body fluids, bones, body organs, *etc.*

link criminals to convict for crimes. Increasingly accepted during the past twenty years, DNA technology is now widely used by police, prosecutors, defence counsels and courts throughout the world. DNA testing can make a virtually positive identification when the two samples match. It exonerates the innocent and helps to convict the guilty. These DNA profiles have revolutionised criminal investigations and become powerful tools in the identification of individuals in criminal and paternity cases.

DNA contains the genetic code of an individual from whom it is taken. It is hereditary and responsible for many attributes of the individuals. DNA is present in the nucleus of every living cell (except red blood cells) of the body so that any trace of blood (white cells contain DNA), semen, or hair root (not hair or nails) found at the scene of the crime may help to ascertain who was present because a DNA profile of the material may be matched with those of suspects. Despite these positive characteristics, there are strong grounds for exercising caution. DNA profiling evidence is not the same as a unique calling card left at the scene of the crime. In particular, using DNA profiles raises questions in three crucial respects: The reliability of the conduct of the tests; their interpretation; and the implications for human rights.[2] Some people think that DNA is like a fingerprint, but they are not similar. A fingerprint is the impression of a finger and nothing else, but DNA contains information that raises much broader privacy and other civil liberties concerns.

Although DNA profiling is used in a similar way to conventional blood grouping, for the elimination or association of suspects with a crime, the possible vast increase in discrimination power allows much firmer statements to be made. There is also only a small chance of a false positive result. The greater discrimination power also means that large population can be screened as an alternative to conventional crime investigation. DNA profiling is complementary to conventional blood grouping in a rape investigation because blood group substances are contained within the seminal fluids, while DNA is contained in the sperm, which can be separated and kept frozen. DNA profiling is an extension of technology which allows more precise results. Today, the use of DNA technology has gained acceptance in the field of forensic and life sciences, and courts in the USA, Europe and Asia have availed of DNA evidence

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2. Peter Alldridge, Sanneke Berkhout-van Poelgeest and Katherine S. Williams, "DNA Profiling and the Use of Expert Scientific Witnesses in Criminal Proceedings" in Phil Fennell *et al.* (eds.), *Criminal Justice in Europe: A Comparative Study* 269-70 (Oxford: Clarendon Press, 1995).

in civil and criminal cases.

II The science of DNA identification

Each person has a unique set of fingerprints. As with a person's fingerprint, no two individuals share the same genetic make up. This genetic make up, which is the hereditary blueprint imparted to us by our parents, is stored in the chemical deoxyribonucleic acid (DNA), the basic molecule of life. Examination of DNA from individuals other than identical twins, has shown that variations exist and that a specific DNA pattern or profile could be associated with an individual.

DNA is the biological material which contains all the genetic information within living organisms, including human beings. The ability of a cell of human body to replicate itself is due to the presence of the DNA "blueprint" in the chromosomes within the nucleus of each cell. Each human cell contains 23 pairs of chromosomes within its nucleus. One half of each pair of chromosomes is provided by each parent at the time of conception. Although most of the information stored in human DNA includes general information common to all humans, some of the information is unique to a particular individual. Only identical twins have identical DNA.

The DNA information unique to a particular individual is stored in genes known as polymorphic genes and their location on a DNA molecule is called a polymorphic site or locus. By isolating and identifying certain segments of the DNA molecule contained in human tissue samples (*e.g.* blood, skin, hair follicles or semen stains), it is possible to identify the individual who is the source of the DNA. Like fingerprints, DNA evidence can be useful in criminal investigations and prosecutions.

At the crime scene, DNA is found in blood, semen, skin cells, tissue, organs, muscle, brain cells, bone, teeth, hair, saliva, mucus, perspiration, fingernails, urine, faeces, *etc.* From so many sources, the chance of finding traces of the perpetrator's DNA at a crime scene is very likely. Using modern techniques, every type of bodily fluid or tissue can potentially yield DNA for testing. Fortunately, that means, many criminals probably left enough evidence to link him/her to the crime scene.[3] Unfortunately,

3. While a DNA test result may reveal that A was in the crime scene, it cannot tell for how many hours A was there and what role A played in the commission of the crime. It may disclose that B had sex with C but it cannot tell that B forced C. Lastly, even if DNA evidence puts D in the murder scene, it cannot speak who as between D and X pulled the knife first.

every individual examining the scene can as well leave his/her own DNA behind. In some cases, sufficient DNA for testing purposes may be obtained from blood or semen smears on the suspect's clothing and has even been obtained from saliva on a cigarette butt. Such smaller and possibly degraded samples are of poor quality than blood samples and may yield less reliable results

Scientific techniques commonly used in DNA identification analysis

DNA identification analysis is the process of isolating and identifying segments of the DNA molecule. The scientific community developed the techniques in order to study human genetics. The research leads to the discovery that the same DNA segment has different length in different individuals and that various analysis techniques will be used to match samples of human DNA. Two analysis techniques are most often used in forensic DNA analysis. These are commonly known as Restriction Fragment Length Polymorphisms (RFLP) and Polymerase Chain Reaction (PCR). The most-commonly used and recognised technique is RFLP. In the RFLP method, the first step is to extract DNA from the evidentiary tissue sample by the use of solvents. Next, the extracted DNA is cut into smaller segments by the use of a restriction enzyme. The location of these restriction sites and the resulting DNA fragment lengths differ among individuals. The idea is that an enzyme is used which cuts the DNA whenever a certain sequence of bases occurs (a restriction site), generating a number of fragments of the DNA of varying lengths. In some individuals, random changes in the DNA will cause one or more sites to be lost or may otherwise cause variation between individuals in those frequent lengths.

Extraction of DNA from cells is a relatively straightforward process. Yields, however, are typically low, and DNA is frequently rapidly degraded once it is no longer within a living organism. A spectacular advance has been the discovery of the Polymerase Chain Reaction (PCR), which permits potentially unlimited amplification of minute DNA traces. Such as may be found in small samples of dry bone or skin. An inevitable consequence of this massive amplification potential is its sensitivity to contamination, particularly if the same forensic laboratory and technicians are handling samples from both the suspect and the crime scene.[4]

The major disadvantage to using RFLP analysis is that DNA samples which have been degraded by exposure to prolonged sunlight or extensive

4. R.C. Lewontin, "The Use of DNA Profiles in Forensic Contexts" (1994) 9 *Statistical Science* 259.

soiling cannot be used. Again, it is relatively easy to determine that two samples are different if one has a band and the other lacks, but it is far more difficult to determine, on the basis of identical banding patterns, that two samples must have come from the same individual. This problem of determining the significance of matches lies at the basis of debate on the use of DNA in legal cases. The major drawback to using PCR amplification analysis is that it is particularly susceptible of contamination.

DNA profiles produced from manufactured kits are routinely used as evidence; these kits operate within a specific range of amounts of DNA, typically 0.5-2.5 nanograms. However, some claim that by varying the conditions under which the kit is used profiles can be produced from much lower amounts of starting or template DNA. This technique has become known as Low Copy Number (LCN) DNA analysis. The LCN technique was specifically designed to analyse amounts of DNA below 0.1 nanograms (100 picograms) and to produce reliable profiles even in the presence of stochastic effects. There has been for some time controversy about its use in the courts in England and some other countries of LCN DNA evidence. With very low number of template DNA molecules, the process may fail to amplify the template which can lead to a number of problems in the interpretation of the resulting profiles.[5]

III Validity and reliability of DNA technology: Problems of standardisation and certification

Given the variation in DNA sequence among individuals, no scientific doubt exists that technologies available today accurately detect genetic differences. Properly performed and interpreted, a sufficiently detailed examination of two samples of DNA can determine if DNA patterns match, and if they do, the likelihood that a single source is responsible for both samples (except in the case of identical twins). In 1990, the US Congress Office of Technology Assessment (OTA) examined DNA typing methods and reported that these were valid and reliable if performed

5. At a time, LCN DNA technique had questions about its validity as admissible evidence in England. That led to the temporary suspension of the LCN technique as the Home Office carried out a review of its applicability for court purposes. In early 2008, that review concluded that it was scientifically robust and, therefore, appropriate for court cases. The Court of Appeal confirmed this approach in *Reed and Garmson* (2009) EWCA Crim 2698.

properly.[6] Nevertheless, it is generally agreed that applying DNA tests to forensic samples, especially criminal evidence, potentially presents more difficulties than applying samples in basic research or clinical diagnosis. Samples from crime scenes are frequently small and might be of poor quality because of exposure to a spectrum of environmental onslaughts.

An important matter in the use of DNA as evidence is whether the detection methods are scientifically valid. The validity centres on whether a test will correctly identify true matches and true non-matches. Initial concern about the validity of DNA typing for forensic applications focused on the nature of the samples. Samples are obtained from a variety of less than sterile materials (*e.g.* glass, wood, dirt, and fabric) that are often subjected to sunlight, moisture or desiccation. Samples can also be contaminated with unknown genetic materials such as bacteria, plant or animal secretions. A great caution must be taken in collecting the evidence while avoiding contamination.[7] The second aspect of DNA testing of forensic samples is reliability. Reliability involves several factors, including the procedures used, laboratory performance, laboratory record keeping, quality control and quality assurance. Finally, although forensic uses of DNA tests are valid and reliable when performed properly, many harbour the misconception that DNA typing applied to forensic samples always yield a "yes" or "no" answer. A test that does not give a 'yes' or 'no' each time is neither incorrect nor unreliable. After the biochemical part of the testing has been done the question will arise whether there is a 'match' between the DNA profile of the accused and that of the sample. This is not without problems. Practice hitherto[8] has been to set an arbitrary threshold of similarity and to treat as irrelevant anything falling short and as compelling anything satisfying the criteria. It has powerfully been argued that:[9]

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6. See U.S. Office of Technology Assessment, *Genetic Witness* : *Forensic Uses of DNA Tests* (Washington, D.C., July, 1990).

7. Contamination usually occurs from touching evidence without wearing gloves, sneezing, coughing and a variety of other mishaps. Some DNA contaminating sources can be eliminated, for example, by taking DNA samples from victims or surrounding witnesses, so their DNA profiles can be identified among the collected forensic samples. Police and crime scene units are usually advised to change their gloves often, avoid talking, sneezing or coughing over any potential evidence.

8. For details, see National Research Council, *DNA Technology in Forensic Science* 53-54 (Washington, DC; National Academy Press, 1992).

9. Bernard Robertson and G.A. Vignaux, 'Why the NRC Report on DNA is Wrong' (1992) 142 *NLJ* 1619.

> Common sense rebels against the notion that sample differing by 2.99 standard deviations (sd) 'match' and that samples differing by 3.01 sd do not 'match'. The problem in fact is the whole idea of a 'match'.

The proper use of DNA samples requires that expertise in molecular biology, population genetics and statistics be brought to bear.[10] The production of the profiles requires biochemical expertise. The hazards of testing include: possible mixing of samples before the tests are carried out; mishandling causing contamination either at the time the sample is collected or later in the laboratory; contamination with bacterial, viral, other human or nonhuman DNA at the scene of the crime. A small sample can complicate the test and make further verification impossible; and the test itself may be carried out incorrectly.[11]

In *People* v. *Castro*,[12] the New York Supreme Court, in the most critical assessment of DNA analysis performed to that date, developed a so-called three prong test for DNA evidence: (1) is there a generally accepted scientific theory arguing that DNA sequence differ between individuals and that difference can be tested, (2) is there a reliable technology that can be performed to detect these DNA differences, (3) was that DNA technology applied correctly in this particular case. Following the application of the three prong test for admissibility of DNA evidence with the *Castro* evidence, the court concluded that it failed prong three, and the testing was not performed correctly in this case. Under the prong three, a scientist may have no trouble accepting the general proposition that DNA typing can be done reliably, yet still have doubts about the reliability of the test being performed by a particular laboratory. The defence asserted that the testing laboratory failed in several major respects to use the generally accepted scientific techniques and experiments for obtaining reliable results, within a reasonable degree of scientific certainty. Following this case, it was determined that some sort of "standard" needed to be in place for DNA testing, so the FBI created the now famous "Technical Working Group on DNA Analysis Methods" to establish universal procedure for testing DNA.

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10. Bernard Robertson and G.A. Vignaux, "Expert Evidence: Law, Practice and Probability" (1992) 12 *Oxford Journal of Legal Studies* 392.

11. National Research Council, *supra* note 8 at 89-90.

12. 545 N.Y.S. 2d 985 Sup Ct. 1989.

In 1990, the National Academy of Sciences of the USA initiated a study by the National Research Council (NRC) of DNA typing methods, and its report, issued in April 1992, recommended, among other things:

- that current DNA typing procedures are fundamentally sound;
- that each laboratory should have a detailed quality assurance programme in place;
- that laboratories have proper accreditation; and
- that a national DNA profile data bank be established, especially of convicted sex offenders and of unidentified samples from crime scenes.

The interpretation of the data sometimes requires expertise in population genetics. Fragments from two people may be the same or similar, especially within a community which has interbred extensively. Such circumstances increase the chances of two profiles being similar, thus rendering the probability that the DNA profile could originate otherwise than with the accused.[13]

IV Admissibility of DNA evidence in criminal cases: A comparative analysis

Lawyers' and other professionals' demand for expert evidence by scientists has increased since the 1980's, reflecting growing recognition that scientists 'have a unique contribution to make to judicial proceedings'. As shown in this paper, DNA experts, including biologists, have been accepted as experts on both sides of the Atlantic and in the Antipodes. Scientists, of course, are called as expert witnesses in both civil and criminal cases. As seen below, the range of cases has been broader in some countries than in others.

The terrain traversed is dotted with very significant developments in the courts' treatment of expert testimony by scientists in a broader range of areas. It is noted that in a major judgment in *Daubert* v. *Merrell Dow Pharmaceuticals*,[14] the US Supreme Court has reasoned its criteria for deciding whether expert evidence shall be admissible. Without abandoning the old 'common knowledge and experience rule', the courts in England

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13. See R.C. Lewontin and Daniel L. Hartl, "Population Genetics in Forensic DNA Typing" (1991) *Science* 1745; John J. Walsh, 'The Population Genetics of Forensic DNA Typing: Could it have been Someone Else?" (1992) 34 *Crim LQ* 469.

14. 509 US 579 (1993).

have opened the door to the scientific expert witnesses. Careful examination of the relevant case law in Australia, Canada and India shows that in a number of recent cases, the courts in these countries have followed a more liberal approach to the interpretation of the common knowledge rule.[15] This paper does not purport to deal with the controversies about the adequacy of legal procedures for selecting or qualifying experts, whether expert testimony can be prejudicial, the objectivity of expert witnesses, the ethics of expert testimony by counter experimental results or the scarcity of generally acceptable scientific methods and theories. Rather, the idea is to show the extent to which the courts are inclined to accept DNA evidence in criminal proceedings.

America

In USA, all scientific evidence in criminal trials including evidence derived from DNA identification analysis, must satisfy the test of admissibility in effect in a particular jurisdiction. In general, courts use one of two tests. The so-called *Frye* test, which was pronounced by the US Circuit Court for the District of Columbia in *Frye* v. *United States,*[16] or one of its variations, is used in a majority of jurisdictions. Under the *Frye* test, a novel scientific technique must have gained general acceptance in the relevant scientific community before it is admitted by the court.

The second rule follows the basic relevancy standard of the federal rules of evidence[17] and is used in a majority of state jurisdictions. For admissibility under the federal rules, scientific evidence must have some relevance to the issues in the case, and its probative value must outweigh the potential for prejudice. In *Daubert* v. *Merrell Dow Pharmaceuticals*,[18] the US Supreme Court ruled that the federal rules of evidence have replaced the *Frye* test in federal court trials. Additionally, the court defined a new federal standard:[19]

> (U)nder the rules, the trial judge must ensure that any and all scientific testimony or evidence admitted is not only relevant, but

15. See I. Freckelton and H. Selby, *Expert Evidence: Law, Practice, Procedure and Advocacy* 160 (Sydney: Lawbook Co., 2002).

16. 293 F. 1013, 1014 (D.C. Cir. 1923).

17. Rules 401, 402, 403 and 702.

18. 509 US 579, 113 S.Ct. 2786 (1993).

19. *Id.* at 2796.

> reliable.[20] Determining reliability entails a preliminary assessment of "whether the reasoning or methodology underlying the (expert) testimony is scientifically valid and… whether (the) reasoning or methodology can be applied properly to the facts in issue".

The court provided a nonexclusive list of factors that may be used to determine scientific validity: (1) whether a theory or technique can be (and has been) tested; (2) whether the theory or technique has been subjected to peer review and publication; (3) the known or potential rate of errors in using a particular scientific technique and the existence and maintenance of standards controlling the technique operation; and (4) whether the theory or technique has been generally accepted in the particular scientific field.[21]

While the *Daubert* test applies to federal courts, most state courts continue to follow the *Frye* test. In general, state and federal courts have increasingly accepted DNA evidence as admissible. In general, courts that have used the *Daubert* standard have been more likely to admit DNA evidence, although many jurisdictions that have relied on *Frye* have also permitted it. Nearly all cases, in which DNA evidence was ruled inadmissible, have been in jurisdictions that have used *Frye*. In *People* v. *Castro*,[22] the New York Supreme Court in a 12 week pretrial hearing exhaustively examined numerous issues relating to the admissibility of DNA evidence. Castro was accused of murdering his neighbour and her 2-year old daughter. A blood stain on Castro's watch was analysed for a match to the victim. The court held:

- DNA identification theory and practice are generally accepted among the scientific community.
- DNA forensic identification techniques are generally accepted by the scientific community.
- Pretrial hearings are required to determine whether the testing laboratory's methodology was substantially in accord with scientific standards and produced reliable results for jury consideration.

The *Castro* ruling supports the proposition that DNA identification evidence of exclusion is more presumptively admissible than DNA identification evidence of inclusion. In *Castro*, the court ruled that DNA

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20. *Id.* at 2795.
21. *Id.* at 2796-97.
22. *Supra* note 12.

tests could be used to show that blood on Castro's watch was not, but tests could not be used to show that the blood was that of his victims. In *Castro*, the court also recommended extensive discovery requirements for future proceedings including copies of all laboratory results and reports, explanations of statistical probability calculations, explanations for any observed defects or laboratory errors, including observed contaminants, and claim of custody of documents. These recommendations soon were expanded upon by the Minnesota Supreme Court in *Schwartz* v. *State*,[23] which noted, "ideally, a defendant should be provided with the actual DNA sample(s) in order to reproduce the results. As a practical matter, this may not be possible because forensic samples are often so small that the entire sample is used in testing. Consequently, access to the data, methodology, and actual results is critical for independent expert review."[24]

In *Schwartz*, the Supreme Court of Minnesota refused to admit the DNA evidence analysed by a private forensic laboratory The court noted that the laboratory did not comply with appropriate standards and controls. In particular, the court was troubled by failure of the laboratory to reveal its underlying population data and testing methods. Such secrecy precluded replication of the test.

As stated in the National Research Council's 1996 Report on DNA evidence, the state of the profiling technology and the methods for estimating frequencies and related statistics have progressed to the point where the admissibility of properly collected and analysed DNA data should not be in doubt.[25] At this time, 46 States admit DNA evidence in criminal proceedings. In 43 States, courts have ruled on the technology, and in 3 States, statutes require admission.

Wisconsin courts have rejected the *Frye* requirement of general acceptance within the scientific community as a prerequisite to admissibility. In *State* v. *Walstad*,[26] the Wisconsin Supreme Court confirmed that Wisconsin's expert witness relevancy standard as promulgated by the Supreme Count and codified in section 907.02, Stats., determines the admissibility of expert testimony:

> Testimony of Expert—if scientific, technical, or other specialised knowledge will assist the trier of fact to understand the evidence

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23. 447 N.W. 2d 422 (1989).

24. *Id.* at 427.

25. National Research Council, *National Academy of Sciences, the Evaluation of Forensic DNA Evidence* 2.14 (Washington, DC: National Academy Press, 1996).

26. 119 Wis. 2d 483, 351 N.W. 2d 469 (1984).

> or to determine a fact in issue, a witness qualified as an expert by knowledge, skill, experience, training, or education, may testify thereto in the form of an opinion or otherwise.

Although many states are still wrestling with the issue of admissibility of DNA evidence, the relevancy test adopted by the Wisconsin Supreme Court in *Walstad* permits the admission of scientific evidence, including DNA evidence regardless of whether the evidence meets the reliability requirements set forth in *Frye* and *Daubert*. As noted by the Wisconsin Supreme Court in *Walstad*: [27]

> The fundamental determination of admissibility comes at the time the witness is "qualified" as an expert. In a state such as Wisconsin, where substantially unlimited cross-examination is permitted, the underlying theory or principle on which admissibility is based can be attacked by cross-examination or by other types of impeachment. Whether a scientific witness whose testimony is relevant is believed is a question of credibility for the finder of fact, but it clearly is admissible.

Again, in *State* v. *Peters*,[28] a case specifically of DNA evidence, the Wisconsin Court of Appeals rejected the argument made by the defendant on appeal that DNA evidence should not have been admitted because the trial court had failed to make a determination as to the reliability of the evidence. In making this ruling, the Court of Appeals held:

> Once the relevancy of the evidence is established and the witness is qualified as an expert, the reliability of the evidence is a weight and credibility issue for the fact finder and any reliability challenges must be made through cross-examination or by other means of impeachment.

Two other important early cases involving DNA testing were: *State* v. *Woodall*[29] and *Spencer* v. *Commonwealth*.[30] In *Woodall*, the West Virginia Supreme Court was the first state High Court to rule on the admissibility of DNA evidence. The court accepted DNA testing by the defendant, but inconclusive results failed to exculpate Woodall. The court upheld the

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27. *Id.* at 487.
28. 192 Wis. 674, 534 N.W. 2d 867 (1995).
29. 385 S.E. 2d 253 (W.Va. 1989).
30. 384 S.E. 2d 775 (1989).

defendant's conviction for rape, kidnapping and robbery of two women. Subsequently, DNA testing determined that Woodall was innocent and he was released from prison. In another case, the Virginia Supreme Court upheld the murder and rape convictions of Spencer, who had been convicted on the basis of DNA testing that matched his DNA with that of semen found in several victims.

In 1996, the National Institute of Justice published a book titled *Convicted by Juries, Exonerated by Science*, which cited the use of DNA technology not only for the conviction of offenders, but also for the exoneration of the wrongly charged or convicted individuals in criminal cases.[31]

England

England is widely recognised as having the most effective and efficient approach to the use of DNA technology in the world. DNA technology and DNA databasing have been central to the process of criminal investigation. Since the establishment of the National DNA Database (NDNAD) in 1995, England has become a world leader in discovering innovative ways to use DNA to identify suspects, protect the innocent and to convict the guilty.

Colin Pitchfork was the first person convicted of murder with the use of DNA. Lynda Mann and Dawn Ashworth, were sexually assaulted and killed in 1983 and 1986, respectively. Semen samples were taken from both victims. The prime suspect was a seventeen year old kitchen porter who confessed to killing Dawn Ashworth. Alec Jeffrey was called in and revealed that semen from the two bodies was from the same man but that man was not the confessing kitchen porter. Leicestershire police then decided to undertake the world's first DNA mass screening. No profiles matched the profile of the killer. A year later, a woman told police that she had overheard, Ian Kelly, bragging that he had given his sample while he was masquerading as his friend. Colin Pitchfork, a local baker had persuaded Kelly to take the test for him. Pitchfork was arrested and his DNA profile found to match with the semen from both murders. Although his case did not actually go to trial due to his confession, he is usually credited with being the first DNA base murder conviction. Collin received a life prison sentence for both the murders in 1988.[31*a*]

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31. E. Conners, *et al., Convicted by Juries, Exonerated by Science : Case Studies in the Use of DNA Evidence to Establish Innocence After Trial* (U.S. Department of Justice, National Institute of Justice , Washington, D.C., June, 1996).

31*a*. [2009] EWCA Crim 963.

In combined appeals of *R.* v. *Reed and Reed* and *R.* v. *Garmson,*[32] the Court of Appeal considered the use of LCN DNA analysis as an evidentiary tool which was challenged in these appeals. In two different cases, the appellants appealed against their convictions to the Court of Appeal. The Reed brothers had been convicted of murder and the forensic scientist had used LCN testing on two pieces of plastic fragments found at the murder scene. Similarly, in Garmson's trial for kidnapping, rape and sexual assault, LCN testing was used in respect of DNA found on four items. Lord Justice Thomas held, in dismissing the appeals, that LCN DNA could be used to obtain profiles capable of reliable interpretation if the quantity of template DNA was above a minimum stochastic threshold of between 100 and 200 picograms. In cases within the range of 100 to 200 picograms, evidence might be necessary as to whether in a particular case a reliable interpretation could be made.

Recently, the (English) Law Commission thoroughly examined the admissibility of expert evidence in criminal proceedings in England and Wales.[33] The Law Commission was in no doubt in favour of reform of the law relating to the admissibility of expert evidence. The commission aims to bring a degree of clarity and certainty to the law and legal processes governing the admissibility of expert evidence. In its view, numerous scientists, practitioners and legal academics have come to the same conclusion, calling for a new basis for screening expert evidence to ensure that only sufficiently reliable evidence will be considered by the jury and the judge. The Law Commission's basic premise was that expert evidence must satisfy a minimum standard of evidentiary reliability to be admissible. Its proposal consists of the introduction of a new statutory test for determining the question of admissibility, supported by guidelines relating to both scientific-based and experience-based expert evidence. The test would require a judge to take on a gate-keeping role. He or she must be satisfied that the evidence is sufficiently reliable to be admitted, namely that it is based on sound principles, technologies, methods and assumptions, that these have been properly applied to the case, and that the conclusions reached are logically sustainable.

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32. (2009) EWCA Crim 2698.

33. Law Commission Consultation Paper No. 190 : The Admissibility of Expert Evidence in Criminal Proceedings in England and Wales: A New Approach to the Determination of Evidentiary Reliability (2009).

Australia

Unlike the United States and Canadian courts, the courts in Australia have had no occasion to articulate, in a comprehensive way, the criteria for admissibility of expert evidence at common law. In this context, the threshold question was whether there is an area of expertise test in the way it exists in the United States, Canada and New Zealand.

There have been several prominent cases on the matter to date in Australia. In *R.* v. *Tran*,[34] the Crown sought to lead evidence of DNA profiling to connect the accused with the rape and murder of the victim. Vaginal swabs and a bloodstain were taken from the deceased and bloodstains also taken from her boyfriend and the accused and sent to Cellmark Diagnostic laboratory (a UK company) for analysis. McInerney J ruled that DNA typing results provided by Cellmark, were inadmissible, owing to doubts about the existence of certain bands in the profile which Cellmark said matched the accused. There was evidence that the actual offender was Vietnamese and, therefore, it was argued that the court should be provided with an estimate of the likelihood of a chance match among the Vietnamese people. Sydney Cellmark did not have a Vietnamese database, but provided estimates for the Caucasian Afro-Caribbean and Indian-Pakistani population of the UK. This was considered the most conservative of the databanks possessed by the Cellmark laboratory. Several scientists of "varying backgrounds" called by the defence questioned the reliability of the prosecution's evidence. Freckelton provides a summary of these concerns. They include possible cross-contamination, technical problems with the reading of the gels, and the fact that the reference database did not match the Vietnamese ethnicity of the defendant. The essence of the McInerney J's reasoning lies in the state of the evidence: since it was unsatisfactory, it had to be excluded. Even if the evidence had not been rejected because the jury could not determine the threshold question, it would have been excluded as more prejudicial than probative. What is significant about *Tran* is, in Freckelton's view, "the telling evidence from the defense scientists which persuaded his Honour of the unreliable aspects of the DNA testing in this case."[35]

In *R.* v. *Lucas,*[36] Hampel J in the Victorian Supreme Court also considered the matter and similarly excluded DNA profiling evidence.

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34. (1990) 50A Crim R 233.

35. See I. Freckelton and H. Selby (eds.), *Expert Evidence* (Sydney: Lawbook Co., 1993) (Loose-leaf Service).

36. (1992) 55 A Crim R 361 : (1992) 2 VR 109.

The prosecution case rested upon circumstantial evidence consisting of a human blood smear on the accused's father's garage wall where the Crown alleged the accused had killed the deceased. The Crown sought to admit the results of DNA tests of blood samples claiming they would show the bloodstain to be blood of either the deceased or of a close relative to a high degree of probability. Various experts differed in their estimations of the new techniques and procedures employed and Hampel J drew attention to the difficultly confronting the jury in resolving those different views and queried whether they could resolve them meaningfully and relate them to the reliability of the tests and the significance of the results. The evidence was, therefore, not admissible because it lacked sufficient probative value compared with its possible prejudicial effect.[37]

It can be said that the Australian law is developing within the framework of judicial perception of the function and capacity of jurors. In this regard, *R.* v. *Jarrett*[38] of the Supreme Court of South Australia is illuminating. In this case, the accused sought exclusion of DNA analysis and the statistical interpretation of that analysis. It was decided, *firstly*, that once it is determined that evidence (including expert evidence) is relevant to a fact in issue, and there is no policy or discretion-based reason for its exclusion, it should be admitted even if it is contested and there is credible expert testimony to the contrary. *Secondly*, it was decided that there is no requirement in Australian law that, where the issue is not admissibility but whether the expert analyst employed recognised and standard techniques or did the work competently, there ought to be a *voir dire* on those issues. *Thirdly,* the court determined that once there is relevance and the conditions for the admission of expert are met, it is difficult to see how the evidence may have a prejudicial effect which outweighs its probative value, unless the probative value is slight. *Fourthly*, on the question of whether the DNA evidence was substantially probative, the court decided that it was, and that any prejudicial effect arose from that probative weight. The evidence (that from a DNA analysis of the blood of various men, only the accused could not be excluded as the donor of the semen) was admissible. The court also observed that the giving of blood for the DNA analysis by the appellant was free and voluntary, and not tainted by any impropriety or unfairness. It was also decided that the computer-generated evidence as to the frequency in the

37. *Ibid.*
38. (1994) 73 A Crim R 160.

general population of the DNA match was admissible and there was no reason to exclude the evidence in the exercise of discretion.

In *R.* v. *Percerep,*[39] the Victorian Court of Criminal Appeal also considered the matter. In an appeal against convictions of armed robbery, the appellant challenged admission of DNA profiling evidence. Prosecution witnesses had admitted upon a *voir dire* that opinions contrary to their own existed in the scientific community, although they were resolute as to the correctness of their own views. Counsel had persuaded the trial judge to exclude the evidence on the basis of it being so imprecise as to lack probative value. Neither of these arguments was accepted by the appeal court as sufficient to warrant exclusion of the evidence.

In *R.* v. *Melaragni*,[40] Moldaver J applied a threshold test of reliability to what was described as "a new scientific technique or body of scientific knowledge".[41] Two factors were mentioned whether the evidence was likely to assist the jury in its fact-finding mission or was likely to confuse and mislead them, and whether the jury was likely to be overwhelmed by the "mystic infallibility" of the evidence or able to keep an open mind and objectively assess the worth of the evidence. Two recent New South Wales cases, *R.* v. *Pantoja*[42] and *R.* v. *Milat*,[43] have added to Australian case law on DNA evidence. The ruling in *Pantoja* emphasises the essential point that DNA evidence merely establishes that the suspect and the offender may be the same person, not that they are the same person. In this particular case, two expert witnesses, using a combination of RFLP analysis and blood substance testing, declared a 'match' between the offender and the suspect, whereas a third expert, using PCR analysis positively excluded the suspect. The appeal court ruled that whatever evidence of a match is found from other blood testing, a single positive exclusion is sufficient to eliminate a suspect. Accordingly, the conviction was quashed and new trial was ordered. *Pantoja* provides a nice illustration of the caution necessary in interpreting the astronomical odds arising from DNA evidence.

It appears from the above cases that Australian courts have shown some reticence in admitting DNA evidence and in protecting the rights of the accused, particularly in the situation of conflicting expert evidence.

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39. (1993) 2 VR 109.
40. (1992) 73 CCC (3d) 348.
41. *Id.* at 353.
42. (1996) 88 A Crim R 554.
43. (1996) 87 A Crim R 446.

This may reflect the inherent resistance of the judiciary to the encroachment of the scientific disciplines as much as concern over civil liberties.

Canada

The Canadian courts have generally admitted expert testimony on a broader range of issues instead of focusing narrowly, as has been the approach of courts in England, Australia and New Zealand. While the impact of the *Daubert* decision on Canadian courts is difficult to predict, it is interesting to note that in R. v. *Johnston*[44] (a DNA case), it was held that the *Frye* test was not part of the Canadian law and that the criteria for admissibility for novel scientific evidence were relevance and helpfulness to the tribunal of fact, helpfulness to be decided by considering a list of fourteen factors. The factors in *Johnston* go beyond those stated in *Daubert*.[45] Freckelton and Selby state that the most important Canadian decision concerning the admissibility of expert evidence is R. v. *Mohan,*[46] in which the Supreme Court determined that the question of expert evidence admissibility is to be decided applying the following four criteria: relevance; necessity in assisting the trier of fact; the absence of any exclusionary rule; and properly qualified expert.[47] The *Mohan* approach has been applied by the Supreme Court of Canada in R. v. *J-LJ*[48] and R. v. *DD*.[49] *Mohan* did hold that evidence that did not meet the *Frye* test could still be admitted if it was shown to be reliable using more varied criteria.[50]

The first known use of DNA evidence in a Canadian case was R. v. *Parent*,[51] where PCR-based evidence was obtained by Crown through a private laboratory. It excluded the accused and was entered with consent at trial. The first case in Canada in which DNA evidence was entered to implicate an accused was in the sexual assault trial of R. v. *McNally*.[52] This was a test case for the RCMP DNA laboratory, as they had not yet opened for routine case work analysis. There, the judge dismissed a

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44. (1992) 69 CCC 395.
45. See I. Freckelton, "Science and the Legal Culture", *Expert Evidence* 111 (1993).
46. (1994) 2 SCR 9 : 1994 89 CCC (3d) 402 at 406.
47. See Freckelton and Selby, *supra* note 15 at 85.
48. (2000) SCC 51.
49. (2000) SCC 43.
50. *Ibid.*
51. (1989) 46 CCC (3d) 414 (Alta. O.B).
52. (1989) O. J. No. 2630 (Ont. Gen. Div.).

defence application to enter into a *voir dire* to determine the admissibility of the DNA evidence concluding that DNA should not be treated any different from other expert evidence and that it was for the jury to assess the weight to be given to it. The accused pleaded guilty after the DNA evidence was heard.

In *R.* v. *Bourguignon*,[53] where the *Frye* standard was also applied, the DNA evidence was admitted. However, the statistical method of conveying the rarity of the matching DNA profile was not permitted to be put before the jury. Instead, the judge permitted only the qualitative statements to be used by the experts (*e.g.* rare, extremely remote, *etc.*) to describe the significance of the matching profiles. In *R.* v. *Legere,*[54] the New Brunswick Court of Appeals held that the science underlying DNA testing was sufficiently credible and reliable, and that the evidence was admissible provided that the specific tests used were relevant and helpful to the trier of fact. The court also said that it was not necessary for jurors to understand all the scientific terms and tests involved in order to evaluate the testimony of DNA expert.

In *R.* v. *Rogers*,[55] the Canadian Supreme Court upheld a Criminal Code provision and the 1998 DNA Identification Act, allowing for retroactive DNA sampling of prisoners without notice. The court found that these offenders' identity have become a matter of state interest and they have lost any reasonable expectation of privacy in their identifying information derived from DNA sampling in the same way as they have lost any expectation of privacy in their fingerprints, photographs or any other identifying measure.

India

The Constitution of India, by article 51A(h) and (j), commands that it shall be the fundamental duty of every citizen of India "to develop the scientific temper, humanism and the spirit of enquiry and reform" and "to strive towards excellence in all spheres of individual and collective activity so that the nation constantly rises to higher levels of endeavour and achievements". Though there is no specific DNA legislation enacted in India, sections 53 and 54 of the Code of Criminal Procedure, 1973 (Cr PC) provide for DNA tests implied and they are extensively used in determining complex criminal cases. Section 53 deals with examination of

53. (1991) O. J. No. 2670 (Q.L.).
54. 401 A.P.R. 321 (New Brunswick Ct. App. 1994).
55. (2006) 1 SCR 554.

the accused by medical practitioner at the request of police officer if there are reasonable grounds to believe that an examination of his person will afford evidence as to the commission of the offence. Section 54 of the Cr PC further provides for the examination of the arrested person by the registered medical practitioner at the request of the arrested person.

By the Amendment Act of 2005, the Cr PC was amended *inter alia* to add new section 53-A which mandates the examination of a person accused of rape by a medical practitioner. By this amendment, new explanation includes within its ambit examination of blood, blood stains, semen, sputum, swabs, sweat, hair samples and finger nails by the use of modern techniques in the case of sexual offences including DNA profiling and such other tests which is necessary in a particular case. Though section 53-A refers only to examination of the accused by medical practitioner at the request of the police officer, the court has wider power for the purpose of doing justice in criminal cases, by issuing direction to the police officer to collect blood samples from the accused and conduct DNA test for the purpose of further investigation under sections 173(8) and 293(4)(e) of the Cr PC.

Apart from these provisions, section 45 of the Indian Evidence Act, 1872 is more important so far as the admissibility of DNA evidence is concerned. Section 45 deals with the opinion of the expert. It states: "When the Court has to form an opinion upon a point of foreign law, or science or art, or as to identity of handwriting (or finger impressions), the opinion upon that point of persons specially skilled in such foreign law, science or art (or in question as to the identity of handwriting or finger impressions) are relevant facts." Section 293 of the Cr PC deals with reports of certain government scientific experts. Section 293(2) provides that the court may, if it thinks fit, summon and examine any such expert as to the subject-matter of his report.

In a number of cases, the courts have opined that medical evidence is only an evidence of opinion and hardly decisive. It is not substantive evidence. But they say that the opinion of the doctor who has conducted the *post mortem* examination and of the forensic science laboratory is reliable. It is further stated that unless there is something inherently defective in the medical report, the court cannot substitute its own opinion for that of the doctor.

Several convictions have occurred in India where the scientific evidence (DNA) has been accepted under section 45 of the Indian Evidence Act. DNA testing has become an established part of criminal justice procedure, and the admissibility of test results in court has become routine. India has

adopted an adversarial system of justice administration and ordinarily medical evidence is admitted only when the expert gives an oral evidence under oath in the courts of law except under special circumstances. The Supreme Court in *Madan Gopal Kakkad* v. *Naval Dubey*[56] held:

> A medical witness called in as an expert and the evidence given by the medical officer is really an advisory character based on the symptoms found on examination. The expert witness is expected to put before the court all materials inclusive of the data which induced him to come to the conclusion and enlighten the court on the technical aspects of the case by explaining the terms of science so that the court although not an expert, may form its own judgment on those materials after giving due regard to the expert's opinion because once the expert's opinion is accepted it is not the opinion of the medical officer but that of the court.

In *Patangi Balarama Venkata Ganesh* v. *State of A.P.*,[57] the Andhra Pradesh High Court held that the opinion of DNA expert is admissible in evidence as it is a perfect science. In this case, the DNA expert had deposed as under: "If the DNA fingerprint of a person matches with that of a sample, it means that the sample has come from that person only. The probability of two persons except identical twins having the same DNA fingerprint is around 1 in 30 billion world population." It means that DNA test gives the perfect identity. It is a very advanced science, the court observed.

In *Goutam Kundu* v. *State of West Bengal*,[58] the Supreme Court expressed the most reluctant attitude in the application of DNA evidence in resolving the paternity dispute arising out of maintenance proceeding. In this case, the father disputed the paternity and demanded blood grouping test to determine parentage for the purpose of deciding whether a child is entitled to get maintenance under section 125 of the Cr PC from him. In this context, the Supreme Court held that:

> Where the purpose of the application was nothing more than to avoid payment of maintenance, without making out any ground whatever to have recourse to the test, the application for blood test couldn't be accepted. It was also held that no person could

56. (1992) 3 SCC 204 at 221-22.
57. 2003 Cri LJ 4508.
58. (1993) 3 SCC 418 at 428.

be compelled to give sample of blood for analysis against his/her will and no adverse inference can be drawn against him/her for such refusal.

In *Thogorani Alias K. Damayanti* v. *State of Orissa*,[59] the Orissa High Court noted that the only restriction for issuing a direction to collect the blood sample of the accused for conducting DNA test would be that before passing such a direction, the court should balance the public interest *vis-à-vis* the rights under articles 20(3) and 21 of the Constitution of India in obtaining evidence tending to confirm or disprove that the accused committed the offence concerned. In balancing this interest, consideration of the following matters would be relevant:[60]

(a) the extent to which the accused may have participated in the commission of the crime;
(b) the gravity of the offence and the circumstances in which it is committed;
(c) age, physical and mental health of the accused to the extent they are known;
(d) whether there is less intrusive and practical way of collecting evidence tending to confirm or disprove the involvement of the accused in the crime;
(e) the reason, if any, for the accused for refusing consent.

The Bombay High Court in *Sadashiv Mallikarjun Kheradkar* v. *Smt. Nandini Sadashiv Kheradkar*,[61] held that the court has power to direct blood examination but it should not be done as a matter of course or to have a roving inquiry. The Bombay High Court even felt that there should be a suitable amendment by the legislature and after noting that nobody can be compelled to give blood sample, it was held that the court can give a direction but cannot compel giving blood sample. In

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59. 2004 Cri LJ 4003.

60. See R.K. Abhichandani, "Impact of New Biology on Justice Delivery System-the Gene Age—A Legal Perspective, paper presented at the Conference on Impact of New "Biology in Justice Delivery System: Issues Relating to DNA Fingerprinting, Intellectual Property Rights and Ethical, Legal, Social Implications", organised by Centre for DNA Fingerprinting & Diagnostics, Hyderabad and NALSAR University of Law, Hyderabad, held on 3-5 October 2003.

61. 1995 Cri LJ 4090.

Raghuvir Desai v. *State*,[62] the Bombay High Court noted that "DNA testing is clinching piece of evidence - DNA testing can make a virtually positive identification when two samples match. It exonerates innocent and helps to convict the guilty."

In *Geeta Saha* v. *NCT of Delhi,*[63] a Division Bench of Delhi High Court had ordered that a DNA test be conducted on a foetus of a rape victim. The court distinguished this case from *Goutam Kundu*, wherein it was held that wife cannot be forced to give blood sample and no adverse interference can be drawn against her for this refusal. In *Ms. X* v. *Mr. Z*,[64] a single judge of the Delhi High Court had allowed a similar application directing that at the cost of husband, the pathology department of All India Institute of Medical Sciences should conduct the DNA test. The DNA test was to be conducted of a foetus. *A fortiori* where the welfare of the child is in issue, a similar test should be ordered.

Although the scientific evidence such as the results of DNA tests are widely accepted in criminal proceedings, such tests have little relevance in paternity disputes. In *Bhabani Prasad Jena* v. *Convener Secretary*, *Orissa State Commission for Women*,[65] the Supreme Court has, however, said that the court should never as a rule grant applications directing one party or the other to undergo DNA test. In this case, the Supreme Court expressed the position as follows:

> In a matter where paternity of a child is in issue before the court, the use of DNA is an extremely delicate and sensitive aspect. One view is that when modern science gives means of ascertaining the paternity of a child, there should not be any hesitation to use those means whenever the occasion requires. The other view is that the court must be reluctant in use of such scientific advances and tools which result in invasion of right to privacy of an individual and may not only be prejudicial to the rights of the parties but may have devastating effect on the child. Sometimes the result of such scientific test may bastardise an innocent child even though his mother and her spouse were living together during the time of conception. In our view, when there is apparent conflict between the right to privacy of a person not to submit

62. 2007 Cri LJ 829.
63. 1999 (1) JCC 101.
64. 96 (2002) DLT 354.
65. AIR 2010 SC 2851 at 2857-58.

> himself forcibly to medical examination and duty of the court to reach the truth, the court must exercise its discretion only after balancing the interests of the parties and on due consideration whether for a just decision in the matter, DNA is eminently needed. DNA in a matter relating to paternity of a child should not be directed by the court as a matter of course or in a routine manner, whenever such a request is made. The court has to consider diverse aspects including presumption under section 112 of the Evidence Act; pros and cons of such order and the test of 'eminent need' whether it is not possible for the court to reach the truth without use of such test.

However, more recently, in *Rohit Shekhar* v. *Shri Narayan Dutt Tiwari*,[66] the Delhi High Court (in a paternity dispute case) examined the concept of DNA testing and the law pertaining to the same. S. Ravindra Bhat J culled out the prevalent laws on the subject and examined them in the light of international decisions, international human rights instruments and national legislations and finally directed the defendant to undergo DNA test to ascertain the paternity of the claimant. In this case, the court heavily relied on international human rights instruments and expressed the view that the right of the child to know of her (or his) biological antecedents is now recognised internationally as being of crucial importance. Major international instruments such as the UN Declaration on Human Rights have recognised the rights of a child irrespective of her (or his) legitimacy and article 7 of the Convention on the Rights of the Child (CRC), 1989 has expressly specified a right to knowledge of parenthood.

While dealing with the aspect as to whether subjecting a person to a medical test is violative of article 21 of the Constitution of India, the Supreme Court in *Sharda* v. *Dharampal*,[67] stated that the right to privacy in terms of article 21 of the Constitution is not an absolute right. Passing of testing order by the court would not be in violation of the right to personal liberty under article 21 of the Constitution. However, in a matter where paternity of a child is in issue, the use of DNA test is to be resorted to only if such test is eminently needed. In *Selvi* v. *State of Karnataka*,[68] the Supreme Court held that the taking and retention of

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66. 2011 (121) DRJ 562 (Delhi). The Supreme Court refused to give in relief to the respondent.

67. AIR 2003 SC 3450.

68. AIR 2010 SC 1974.

DNA samples which are in the nature of physical evidence does not face constitutional hurdles in the Indian context. However, if the DNA profiling technique is further developed and used for testimonial purposes, then such uses in the future could face challenges in the judicial domain. Hence, the use of material samples such as DNA for the purpose of comparison and identification does not amount to a testimonial act for the purpose of article 20(3).

Some authors feel that while the underlying principles of the technique (DNA typing, for example) cannot be questioned, legal scrutiny can only revolve around questions related to the collection, forwarding and authentication of samples.[69] However, other authors feel that there is as yet no proper international (and national) guideline and that each laboratory has its own control and standardisation method. But the fact remains that the court is unlikely to understand in any detail the principles of the process.[70] The expert's opinion is taken by the courts on trust and faith.[71] Some courts may still be reluctant to admit some type of scientific evidence (like DNA typing) as they may feel that it does not follow the *Frye* test. However, of late, it is generally held that unless there is some special circumstance, all relevant evidence is admissible.[72]

V DNA testing and human rights

The use of DNA (and other scientific evidence) has raised a number of concerns about increased police powers and the unquestioning adoption of a conservative crime control agenda in the administration of criminal justice system. These concerns are clearly legitimate, given the current attack on the right to silence as a protective clock for "the guilty". The lack of critical debate over the use of scientific technology in this erosion of civil liberties points to a reconstruction of the notion of "justice" which corresponds to the idea of a value-free scientific method. International human rights law provides that everyone has a right to a fair and public hearing by the independent and impartial tribunal. It is essential to a fair trial that the suspects have the opportunity to challenge the

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69. V.V. Pillayi, *Textbook of Forensic Medicine and Toxicology* 89 (Hyderabad: Paras Publishing, 2004).

70. K.S. Narayan Reddy, *The Essentials of Forensic Medicine and Toxicology* 387 (Hyderabad: Sugunadevi K. Rao NG, 2004).

71. *Ibid.*

72. K. Vij, *Textbook of Forensic Medicine: Principles and Practice* 135 (New Delhi: B.C. Churchill Livingstone, 2001).

reliability of the scientific testing.

In order to use DNA profiling, it is necessary to obtain certain types of body material. The sample may be obtained by chance. In a case where the sample is obtained without coercion (for example, by taking a hair follicle from the defendant's clothing), the sample is lawfully obtained both in India and many other countries. The crucial legal question is whether it is permissible to use body samples for DNA testing which have been obtained by chance. This question has not been fully resolved. Two lines of reasoning are possible. The first is that the DNA test as such forms no separate interference with the right to the integrity of the body, so if the body material has been obtained lawfully, there is also the right to perform a DNA test on such material. This line is based on the view that there is no legal consideration specific to DNA testing. The second line of reasoning is based on the view that all persons have the right to decide what happens to their own body tissue. This method of reasoning is specially strong in health law. It is based on the view that there is a need for greater protection of body tissue, as a consequence of the evolution of science. According to this view, DNA testing as such is an interference with the right to integrity of the body, resulting from prior interference, caused by the taking of body materials against the suspect's will.[73] According to the Dutch Supreme Court, the taking of body tissue from the suspect for the purpose of DNA testing is not permitted under the existing law.[74]

In this context, attention may be drawn to the European Convention on Human Rights (ECHR). The use of force to obtain DNA samples must be considered in the light of articles 3 and 8 of the ECHR. Of these, article 3 covers extreme interferences with the physical or psychological integrity of the person. In practice, contravention of article 3 is unlikely partly because the authorities would stop before that point is reached but also because most people would submit.[75] Breach of article 8 is more likely. Clearly, the non-consensual taking of a blood sample is an interference with private life contrary to article 8(1).[76] It would only

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73. See the comment of the Dutch section of the Commission of Jurists for Human Rights, *NJCM Bulletin* 1992, 410-54, especially pp. 433-41.

74. (1990) NJ 751.

75. Though the mere threat may itself conflict with art 3; see *Campbell and Cosans* v. *United Kingdom*, (1982) 4 EHRR 293.

76. Even minimum physical interference with a person against his/her will contravenes this article: *X* v. *Netherlands*, Commission Division 14 December 1978, App. 8239/78.

be permitted if it is 'in accordance with the law' and 'necessary in a democratic society.... for the prevention of crime and for the protection of other rights'.[77] According to *Kruslin*,[78] to be 'in accordance with the law', the power must be clearly set out in law; its consequences accessible to the person; and it must be compatible with the rule of law.[79] As indicated in *Kruslin*[80] and *Malone*,[81] the last requirement is the most useful control because, to be compatible with the rule of law, there must be some practical and meaningful control incorporated into the domestic law which will protect against arbitrary interferences or misuse of discretionary powers. The checks required in any law depend on the severity of any interference with human rights.

In *R. (on the application of S.)* v. *Chief Constable of South Yorkshire*,[82] the contentious issues before the Court of Appeal (in the U.K.) arose in respect of the retention of fingerprints and DNA samples taken from persons who had been suspected of having committed offences in the past but were not convicted for them. It was argued that this policy violated articles 8 and 14 of the ECHR. Article 8 deals with the 'right to respect for private and family life' while article 14 lays down the scope of the 'prohibition against discrimination'. Lord Woolf CJ who delivered the judgment of the court, had this to say:

> So far as the prevention and detection of crime is concerned, it is obvious the larger the databank of fingerprints and DNA samples available to the police, the greater the value of the databank will be in preventing crime and detecting those responsible for crime. There can be no doubt that if every member of the public was required to provide fingerprints and a DNA sample this would make a dramatic contribution to the prevention and detection of crime. To take but one example, the great majority of rapists who are not known already to their victim would be able to be identified.

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77. To be 'necessary', it need not be indispensable or absolutely necessary, but it must be more than useful, desirable or reasonable. There must be a 'pressing social need', the interference must be 'proportionate to the legitimate aim pursued'. See, e.g. *Handyside* v. *United Kingdom* (1976) 1 EHRR 737.

78. *Kruslin* v. *France* (1990) 12 EHRR 547.

79. *Id.* at para 27.

80. *Id.* at para 30.

81. *Malone* v. *United Kingtom* (1985) 7 EHRR 14, paras 67-8.

82. (2003) 1 All ER 148 at 155 (CA).

It is a well established rule of English law that any evidence which is relevant is admissible even if it has been obtained illegally provided the purpose is to prevent serious crimes. This approach was reflected in the decision of the House of Lords in *Attorney General's Reference (No. 3 of 1999)*,[83] where Lord Steyn said:

> It must be borne in mind that respect for the privacy of defendants is not the only value at stake. The purpose of the criminal law is to permit everyone to go about their daily lives without fear of harm to person or property. And it is in the interests of everyone that serious crime should be effectively investigated and prosecuted. There must be fairness to all sides. In a criminal case this requires the court to consider a triangulation of interests. It involves taking into account the position of the accused, the victim and his or her family, and the public.

The Council of Europe Recommendation does not forbid the use of coercion in relation to the taking of DNA samples for analysis, but states that "....the introduction and use of these techniques should take full account of and not contravene such fundamental principle as the inherent dignity of the individual and respect for the human body, the rights of the defence and the principle of proportionality in the carrying out of criminal justice."

The most crucial question in forensic use of DNA technology is that of forced testing. In U.K., a distinction is made between intimate and other body samples. A non-intimate sample can, under appropriate circumstances, be taken without consent.[84] An accused cannot be forced to donate an intimate body sample such as a sample of body fluid.[85] In England and Wales, if the suspect, without good cause, refuses to comply with a request in proper form to give an intimate body sample, the court can draw such inferences as it sees proper from the refusal. This means that refusal to supply a sample is capable of amounting to evidence of guilt. Failure to supply samples when an appropriate request is made may also be used to corroborate other evidence.[86] The safeguards against abuse are: that the suspect may only be asked to provide an intimate body sample if there are reasonable grounds for suspecting that he has

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83. (2001) 1 All ER 577 at 584.
84. Police and Criminal Evidence Act (PACE), 1984, s. 63 (3).
85. *Id.*, s. 62.
86. *Id.*, s. 62 (10).

been involved in a serious offence. In India, the DNA Profiling Bill, 2007, which is pending in Parliament, is expected to be considered and become a law sometime in future. If this were to happen, all convicted criminals across the country will have to undergo mandatory DNA tests.

VI Retention, use and destruction of DNA database

With improvement in computer technology, it has become increasingly easy to store, search and analyse large amounts of data, and this in itself has promoted an increase in the amount of DNA information that is gathered. The Canadian government has developed the world's most automated and sophisticated DNA database, capable of automatically identifying persons through analysis of minute amounts of blood, semen, or skin cells. Britain has the world's biggest DNA database with samples from more than 4.5 million people. Some commentators believe that the law that has allowed the police to hold onto DNA from people, even if charges against them are dropped or if they are found to be innocent, should be changed. They fear being on a criminal database breaches their human rights.

One major area to be considered is the question whether DNA profiles of either convicted or suspected persons should be stored on a databank for possible use in future cases. In certain international crimes, DNA samples may be used as part of the evidence. In these cases, DNA databanks will be of international use and importance. It may be that the information contained in DNA databanks will be shared between the forces in different countries for solving crime problems. The greatest advantage of DNA databank is its potential to recover abducted children, assisting adults with amnesia, providing security to Alzheimer patients.

In *Kaemmerling* v. *Lappin and Mukasey*,[87] the US Court of Appeals for the District of Columbia held that the collection of DNA from a convicted felon for database purposes does not violate the Religious Freedom Restoration Act, 1993 or the First, Fourth and Ninth Amendments of the Constitution. In *United States* v. *Pool*,[88] the District Court of California upheld the constitutionality of DNA sample collection from all those arrested upon possible cause for the commission of a federal felony finding.

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87. 553 F. 3d 669 (D.C. Cir. 2008).

88. No. CR S-09-0015, 2009 U.S. Dist. WL 215029 (E.D. Cal. July 15, 2009).

Apart from these beneficial aspects, it is said that the storage and use of such data implies an interference with the right to privacy guaranteed by international human rights instruments and national laws. In England, if a suspect is cleared of an offence or if no prosecution is brought, section 64 of the PACE requires the destruction of all intimate and non-intimate body samples collected pursuant to sections 62 and 63. But the section does not require the destruction of the DNA profile once it has been obtained nor is there any thing which would prevent its use for the purpose not directly related to the particular crime under investigation. If the individual is convicted, there appears to be no protection at all. Better protection is afforded to fingerprint evidence under the amendment made to section 64 of PACE in 1988.[89] In *S. and Marper* v. *United Kingdom*,[90] the European Court of Human Rights rejected the practice in UK of retaining without time limit the DNA samples, DNA profiles and fingerprints of suspects who have been cleared or never convicted.

The greatest danger of a forensic DNA databank is its potential to engulf a significant part of the population to be a genetic population. Imagine a state policy where the government had samples of tissue and fluid from the entire community on file and a computerised databank of each individual's DNA profile. In that situation, not only law enforcement officials, but insurance companies, employers, schools, adoption agencies and many other organisations could gain access to those files on a "need-to-know" basis or on a showing that access is "in the public interest". Imagine then that an individual could be turned down for jobs, insurance, adoption, health care and other social services and benefits on the basis of information contained in his/her DNA profile, such as genetic disease, heritage, or someone else's idea of a genetic "flaw".[91] One of the major concerns people have voiced about the DNA database is its potential conflict with presumption of innocence.

In the criminal justice system, the use of a DNA testing for matters of identification, is becoming more widespread. National DNA databases are becoming increasingly important; the idea being that storing criminal's DNA will provide faster and better services in solving future crimes. With many criminals re-offending a database would allow police to immediately identify them in new crimes.

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89. Criminal Justice Act, 1988, s. 148.

90. (2009) 48 EHRR 50.

91. Zanet C. Hoeffel, "The Dark Side of DNA Profiling: Unreliable Scientific Evidence Meets the Criminal Defendant", 42 *Stanford L.R.* 465 at 533-34 (1990).

VII Conclusion

Although DNA testing has accomplished a great deal in opening up new sources of forensic evidence, its full potential to identify perpetrators and exonerate people falsely convicted has yet to be realised. For this to be done, further advances are required in testing technology and in systems to collect and process the DNA evidence. The development of forensic DNA testing has expanded the types of useful biological evidence. In addition to semen and blood, such substances as saliva, teeth and bones can be the sources of DNA. These sources are expanding still further.

Lawyers are wary of DNA profiling for a number of reasons, some good and some not. DNA profiling is the most powerful break yet to appear with the English common law tradition of the right against self-incrimination. Lawyers do not like 'machine' evidence, where a scientific technology in effect dominates a verdict; they believe that DNA profiling is not a foolproof and flawless investigative and probative tool. In the hands of the skilled operator, it provides incisive results. In the hands of a fool, it provides rubbish. Its major strength is that the rubbish is obvious, it will not produce a false positive result from a sample (a false positive is the conviction of an innocent party). However, the process is still only as reliable as the sample it receives, so if there is a careless or fraudulent collection of sample from the crime scene or suspect, the result would be wrong, independent of the accuracy of the science. If the sample is degraded, the odds *ratio* will have less probative value. The process involves a very large number of small steps, each of which has to be done correctly. The major source of error is in mixing up transfers of material from one step to the next. In addition, there are problems over quality assurance, interpretation of the test, independent scrutiny, and rights of the defence to gain access to the evidence. All these difficulties should at least generate accepted methods and standards of testing and quality controls. In England and Wales, the Royal Commission on Criminal Justice considered these issues and suggested a number of measures to ensure that such evidence is carefully obtained, tested and presented and that the rights of defence are preserved.[92]

Despite many challenges, the technique is unique in the way that it is the power of DNA profiling to exclude the innocent that is its greatest

92. See the *Report of the Royal Commission on Criminal Justice* (London: HMSO, 1993), chap. 9.

value to society. It also shows a quantum jump in its ability to convict the guilty. Justice demands a full understanding of the technology by the courts and the general public. The technique is also valuable in the sense that it has become commercially valuable property as current patent challenge testify. A recent survey of forensic experts revealed widespread frustration with the lack of scientific knowledge by lawyers. The lawyers and judges be briefed before trial about complex scientific information that may assist them in understanding the DNA profile and its evidentiary value in the administration of criminal justice.