Kurt Aaron Oration
Princess Alexandra Hospital
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"Confronting Challenges for Genetics and the Law"

Chief Justice Paul de Jersey AC[*]

Introduction

I am gratified to have the opportunity to be associated, in even a small way, with the late Dr Kurt Aaron, to whose memory this oration is devoted. Dr Aaron's legion achievements included founding the Princess Alexandra Hospital Society during a lifetime of service to the institution. It is impossible to underestimate his contribution. His legacy is perhaps most prominently evident in the continuing vivacity of the society he founded; and on that note, it is also opportune to thank and congratulate members of the society for their tireless ongoing work.

I hope to do justice to Dr Aaron by focusing on the law's capacity to regulate genetic research, and the products of that research, in a manner that optimises the benefits to society while simultaneously safeguarding the rights of the individual. The issue is a vital one; in 1993, Justice Michael Kirby, of this country's High Court, ventured that:

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[*] I am grateful to my Associate, Mr Chris Peters, for his comprehensive assistance in the preparation of this paper.

> "Perhaps, from the perspective of history, the most important scientific breakthrough of this century may be seen, in time, to be neither nuclear fission, nor interplanetary flight, nor even informatics, but the fundamental and basal molecular biology which permits the human species to look into itself and find, at last, the basic building blocks of human and other life."[1]

Time will determine the accuracy of Justice Kirby's observations. Certainly, though, nothing has occurred in the intervening decade to rebut his forecast, and much has occurred to reinforce it. The most prominent example of that reinforcement has been the remarkable, and much-publicised, advances in genetics achieved by the Human Genome Project. Although the minutiae of that venture are beyond the full comprehension of the layperson, the project plainly represents an important contribution to human knowledge.

Yet even as we laud the advances in knowledge and the benefits to society derived from such developments, challenges inescapably confront us. For example, questions arise about the effectiveness of existing laws regulating the conduct of genetic research. Issues relating to privacy and discrimination based on genetic information loom large. And from the perspective of the judiciary, debate surrounding the use of DNA and other genetic evidence in court proceedings is of considerable import.

These are challenges that have not gone unnoticed in Australia. Only two months ago, for example, Melbourne hosted the International Congress of

[1] Justice M Kirby, "Legal Problems: Human Genome Project" (1993) 67 *ALJ* 894 at 903.

Genetics, which incorporated detailed discussion of these issues.[2] With potentially further-reaching effects, on 28 March this year, the Australian Law Reform Commission (in conjunction with the Australian Health Ethics Committee of the National Health and Medical Research Council) released a report entitled *Essentially Yours: The Protection of Human Genetic Information in Australia*[3]. The report introduces its research as follows:

> "… the rapid pace of change has produced two powerful, but conflicting, social reactions. On the one hand, there is very strong public support for breakthroughs promising better medical diagnosis and treatments, and for assisting with law enforcement (including identification of missing or deceased persons); on the other, there are anxieties about increased loss of privacy and the potential for genetic discrimination, as well as about the capacity to regulate genetic science in the public interest.
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> The major challenge … [is] … to find a sensible path that meets twin goals: to foster innovations in genetic research and practice that serve humanitarian ends, and to provide sufficient reassurance to the community that such innovations will be subject to proper ethical scrutiny and legal (and other) controls."[4]

[2] See http://www.geneticscongress2003.com.
[3] ALRC, *Essentially Yours: The Protection of Human Genetic Information in Australia*, ALRC, Sydney, 2003.
[4] Note 3 at 33.

That statement succinctly identifies the challenge that collectively confronts members of the medical and legal professions, and the broader community. The ALRC report, which extends to two volumes and over 1100 pages, is comprehensive in its scope, and I commend it to you. My address today is necessarily more limited in its compass, focusing on three specific issues with particular relevance to the law: the regulation of genetic research, the interaction of genetics with privacy and anti-discrimination law, and the admissibility of genetic evidence in courts.

The Nature and History of Genetic Research

However, before considering any of those issues specifically, it is worthwhile very briefly, and with due deference to an audience far better acquainted with technical medical concepts than I, to recapitulate the history of genetic research. Please bear in mind the comments of Dr Robert Elston, who, in describing a complicated figure relating to statistical genetics, said: "There must be many persons in the audience for whom this is Greek; and I suspect there are even some who would find it more comprehensible if it were Greek."[5] I fear I boast no comprehension of Greek, yet I still fall comfortably into the latter group on this topic.

Practically, awareness of genetics is not new; Gregor Mendel undertook molecular genetic analysis during the 19th century, and his near-contemporary Charles Darwin's theories of evolution related closely to the study of genetics. However, the most famous advance occurred in the early 1950s, when Drs James Watson and Francis Crick discovered the composition of the four

[5] R Elston, "1996 Allan Award Address" (1997) 60 *American Journal of Human Genetics* 255.

components of DNA (the basic genetic material).[6] Subsequent research has built swiftly on that foundation, developing our understanding of genetics to an extent that has enabled, in recent years, remarkable advances such as the identification of the BRCA genes relating to breast cancer, and the cloning of Dolly the sheep. And of course, as I mentioned earlier, the most prominent development of all is the Human Genome Project, which aims to map and sequence the approximately 32,000 genes of the human genome.[7] To quote one paper on the topic, "its scope is pervasive and its potential legal implications are vast."[8] To quote another, it is "a prodigiously expensive international voyage of scientific discovery."[9]

Comments made by Benjamin Franklin in 1783 provide a neat précis of the progress of genetic research. He wrote that "the progress of human knowledge will be rapid and discoveries made of which we at present have no conception. I begin to be almost sorry I was born so soon since I cannot have the happiness of knowing what will be known in years hence."[10] That sentiment applies perfectly to human understanding of genetics; no doubt the former American President would be astounded at the progress that has been made in this field, and would marvel at the continuing opportunities to further that progress.

[6] J Watson and F Crick, "A Structure for Deoxy-ribose Nucleic Acid" (1953) 171 *Nature* 737.
[7] See http://www.ornl.gov/hgmis.
[8] A Patrinos and D Drell, "Introducing the Human Genome Project: Its Relevance, Triumphs and Challenges" (1997) 36(3) *The Judges' Journal* 5 at 5.
[9] R Brownsword, W Cornish and M Llewelyn, "Human Genetics and the Law: Regulating a Revolution" in R Brownsword, W Cornish and M Llewelyn (eds), *Law and Human Genetics: Regulating a Revolution*, Hart Publishing, 1998 at 1.
[10] President B Franklin, letter to Sir J Banks, 27 July 1783.

The Challenges of Genetic Research

Paradoxically, though, it is the astounding pace of scientific discovery that represents the greatest threat posed by genetic research, as advances outstrip regulation. On one hand, there are clearly benefits in allowing researchers the freedom to experiment. Most obviously, those benefits include an improved capacity for the prevention and cure of disease and illness. From the perspective of the courts, the relatively unbiased, objective nature of DNA evidence represents an important incremental advance favouring the interests of justice, if not a virtual sea-change in criminal law.

On the other hand, for all the potential upside associated with genetic research and its products, there are also potential costs. In conducting genetic research, scientists must be careful to maintain the integrity of their research methodology and the interests of their research subjects. Information derived from genetic research is inherently personal in nature, and questions of privacy necessarily attend its unveiling. And the courts must be vigilant to ensure that the inherent principles of justice and fairness are not compromised by juries' misunderstandings of the complexities of DNA evidence.

The solution is to achieve a balance of sorts, between an extreme of permitting absolute freedom in genetic research and the use of its products, and another extreme of placing severe restrictions on such research. But that balance is necessarily fragile, and the precise point of compromise is unclear and debatable. Former US President Bill Clinton encapsulated the challenge, noting that "the extraordinary promise of science and technology carries with

it extraordinary responsibilities. It is incumbent on both scientists and public servants to ensure that science serves humanity always, and never the other way around."[11]

Confronting Challenges in Genetics and the Law

The Regulation of Genetic Research

I turn then, to the first issue identified earlier; that is, the manner in which genetic research is carried out. Regulation of medical research is a topic which has demanded the world's attention since the atrocities committed during the Nazi regime in Europe became apparent.[12] The world's response was the Nuremberg Code, a set of ethical principles relating to medical research propounded at the post-WWII Nuremberg trials.[13] In 1964, the Code was supplemented by the World Medical Association's Declaration of Helsinki.[14]

The principles espoused in those instruments reflect an overriding concern for the protection of the subject.[15] The first principle of the Nuremberg Code is that "the voluntary consent of the human subject is absolutely essential." The Declaration of Helsinki insists upon the informed voluntary consent of

[11] President W Clinton, "Remarks by the President to the American Association for the Advancement of Science," Science Innovation Exposition, Philadelphia, 13 February 1998. Available at http://www.aaas.org/meetings/1998/clinton98.htm.
[12] See G Annas and M Grodin, *The Nazi Doctors and the Nuremberg Code*, Oxford University Press, Oxford, 1992.
[13] *Trials of War Criminals before the Nuremberg Military Tribunals under Control Council Law No. 10*, Vol. 2, US Government Printing Office, Washington DC, 1949 at 181-182.
[14] Available at http://www.wma.net/e/policy/pdf/17c.pdf.
[15] See Declaration of Helsinki, art 5.

subjects to participation,[16] the development of an experimental protocol monitored by an independent ethical review committee[17] and general respect for humans and their health and rights.[18] These ethical principles still found the international community's perceptions of the appropriate standards of conduct for those engaged in medical research, including genetic research.

More recently, those general principles have been supplemented by more specific instruments, such as the Universal Declaration on the Human Genome and Human Rights adopted by the United Nations Educational, Scientific and Cultural Organisation (UNESCO).[19] Among that document's key principles is the imperative that "in all cases, the prior, free and informed consent of the person concerned shall be obtained."[20]

In Australia, the regulatory scheme governing medical research derives its substance from those international instruments. The body overseeing such regulation is the National Health and Medical Research Council (NHMRC),[21] which was established as a statutory entity under the *National Health and Medical Research Council Act* 1992 (Cth),[22] although it has been in existence since 1936.[23] The general functions of the NHMRC are to inquire into, issue guidelines on, and advise the community on, matters relating to the improvement of health, the prevention, diagnosis and treatment of disease,

[16] Declaration of Helsinki, art 20.
[17] Declaration of Helsinki, art 13.
[18] Declaration of Helsinki, art 8.
[19] Adopted by the UNESCO General Conference at its 29th session, 11 November 1997 (developed by the UNESCO International Bioethics Committee).
[20] *Universal Declaration on the Human Genome and Human Rights*, art 5(b).
[21] The NHMRC's website is http://www.nhmrc.gov.au.
[22] *NHMRC Act* s 6(1).
[23] A Federal Health Council and Health Research Council came into existence in 1926, but combined to become the NHMRC on 17 September 1936.

the provision of health care, public health research and medical research and ethical issues relating to health.[24] It also makes recommendations to the Commonwealth on public health research and training and on medical research and training.[25]

More specifically, the Act dictates that the NHMRC must issue guidelines for the conduct of medical research involving human beings.[26] Such guidelines are initially formulated by the Australian Health Ethics Committee (AHEC),[27] one of two principal committees of the NHMRC established by the Act,[28] before being placed before Parliament.[29]

Following these procedures, the NHMRC has issued a National Statement on Ethical Conduct in Research Involving Humans,[30] supplemented by specific notes on the use of human fetal tissue[31] and somatic gene therapy.[32] According to the Statement, its primary purpose is "the protection of the welfare and the rights of participants in research,"[33] and its secondary purpose is "to facilitate research that is or will be of benefit to the researcher's community or to

[24] *NHMRC Act* s 7(1)(a).
[25] *NHMRC Act* s 7(1)(c).
[26] *NHMRC Act* s 8(1).
[27] *NHMRC Act* s 8(2).
[28] *NHMRC Act* s 35(1).
[29] *NHMRC Act* s 35(4). The guidelines are to be placed before Parliament within 15 sitting days of the issuing of the guidelines.
[30] NHMRC, *National Statement on Ethical Conduct in Research Involving Humans*, AGPS, Canberra, 1999. Available at http://www.nhmrc.gov.au/publications/pdf/e35.pdf.
[31] NHMRC, *NHMRC Statement on Human Experimentation and Supplementary Notes 1992: Supplementary Note 5*, AGPS, Canberra, 1992. Available at http://www.nhmrc.gov.au/issues/humanexp/supp5.htm.
[32] NHMRC, *Guidelines for Ethical Review of Research Proposals for Human Somatic Cell Gene Therapy and Related Therapies*, AGPS, Canberra, 1999. Available at http://www.nhmrc.gov.au/publications/pdf/e38.pdf.
[33] NHMRC, note 30 at 1.

humankind."[34] The Statement thereby immediately elevates to pre-eminence the interests of the participants in research.

In addressing those purposes, the Statement outlines a series of general principles of ethical conduct designed to apply to all research involving human beings. These principles suggest that researchers should be guided by values of integrity, respect for persons, beneficence and justice.[35] It also dictates more specific requirements for the conduct of research, including that in all but certain specified cases, the researcher must obtain the unambiguous consent of the subject.[36] The research should be justifiable in terms of its contribution to knowledge,[37] and should be subject to review by a Health Research Ethics Committee established by the entity conducting the research.[38]

The principles espoused in the NHMRC's Statement can be traced back to the Nuremberg Code and the Declaration of Helsinki, and, substantively at least, provide an appropriate framework by which the Australian scientific community can be guided. Nonetheless, the ALRC raises some legitimate concerns about the present situation, and makes several recommendations designed to improve the regulatory process.

[34] NHMRC, note 30 at 1.
[35] NHMRC, note 30 at 11-12.
[36] NHMRC, note 30 at 12-13.
[37] NHMRC, note 30 at 13.
[38] NHMRC, note 30 at 15-22

For example, one prevailing difficulty is that private research bodies are not required to comply with the Statement,[39] a difficulty whose relevance is likely to compound in line with the increasing commercialisation of medical and other scientific research. By virtue of their overriding commercial focus, private institutions are arguably more vulnerable to compromising the integrity of the research process. While there appears to be widespread voluntary compliance with the Statement,[40] that may not always be true, and the suggestion that compliance mechanisms be enhanced is meritorious.

The report also raises several other practical concerns about the current regulatory regime. Plainly, the present scheme is imperfect, and some tinkering may be necessary. Equally, however, that does not imply that the present scheme is unworkable. Its structural foundations are sound; the NHMRC's Statement rests on the accepted ethical principles set out in the Nuremberg Code and the Declaration of Helsinki. Ultimately, then, given some minor adjustments, and more importantly, provided scientists and lawyers are vigilant in operating within the firm ethical framework laid down by the NHMRC, the near-term future conduct of genetic research in Australia seems to be safe.

Privacy and Discrimination

Assuming that genetic information is obtained in an appropriately regulated fashion, questions immediately arise about its practical use. I turn then to the question of genetic privacy and the prevention of genetic discrimination.

[39] ALRC, note 3 at 388.
[40] ALRC, note 3 at 388.

These issues, as much as the regulation of research itself, are vital to the continuing development of genetics as a respected branch of medicine.

Threats in this area are unfortunately omnipresent. Genetic information is inherently difficult to protect, given its transferable nature. Moreover, the consequences of a breach of privacy are potentially devastating: genetic information could be used in a variety of contexts to the detriment of affected persons. Examples include discrimination in employment and insurance, where evidence of a genetic disposition to certain conditions could be valuable in restricting access to jobs or cover. While there is little evidence that employers are currently seeking access to employees' genetic information,[41] ongoing advances in technology may encourage an increasing focus by employers on genetic predispositions. The film *Gattaca* provides a startling insight into the future possibilities; the following excerpt refers to an officially sanctioned genetic underclass:

> "Officially they are called "in-valids" … they are the "healthy ill". They don't actually have anything yet – they may never have. But since few of the pre-conditions can be cured or reversed, it is easier to treat them as if they were already sick."[42]

The significance of these issues is enhanced by the fact that the devastating consequences to which I have alluded apply not only to the individual whose genetic privacy is breached, but also to a range of persons such as blood

[41] ALRC, note 3 at 45.
[42] A Niccol, *Gattaca*, Columbia Pictures, 1997.

relatives whose genetic makeup may be similar.[43] According to the ALRC, "the familial or collective nature of genetic information is a characteristic that needs to be given special attention in considering the application of information privacy principles to genetic information."[44] Plainly, genetic privacy is more than a merely esoteric academic issue.

The present legal position has been unflatteringly described as a system of "complex, fragmented and overlapping frameworks."[45] However, as the ALRC report notes, the *Privacy Act* 1988 (Cth) currently covers "personal information" and "health information",[46] and it does therefore provide protection for genetic information.[47] However, it fails to cover the samples from which the genetic information is derived,[48] and this is an area in which regulation could be improved.

To ensure their effectiveness, provisions maintaining genetic privacy must be backed by anti-discrimination strictures. Internationally, article 6 of the Universal Declaration on the Human Genome and Human Rights provides an aspirational statement in relation to discrimination. It reads: "no one shall be subjected to discrimination based on genetic characteristics that is intended to infringe or has the effect of infringing human rights, fundamental freedoms and human dignity." A similar statement is contained in the Council of

[43] ALRC, note 3 at 238-240; NHMRC, note 30 at 46.
[44] ALRC, note 3 at 238.
[45] ALRC, note 3 at 38.
[46] Both terms are defined in the *Privacy Act* 1988 (Cth), s 6(1).
[47] ALRC, note 3 at 236.
[48] ALRC, note 3 at 262-267.

Europe's Convention on Human Rights and Biomedicine[49], article 11 of which provides that: "any form of discrimination against a person on grounds of his or her genetic heritage is prohibited."

In Australia, there are a number of legislative anti-discrimination mechanisms in place.[50] However, the ALRC has concluded that none of the existing mechanisms effectively prevents discrimination on the basis of genetic information.[51] The ALRC has recommended that the *Disability Discrimination Act* 1992 (Cth) be amended to dictate explicitly that discrimination based on genetic status is illegal.[52] The existing absence of such a measure provides an insight into the speed with which genetic research has emerged, and the difficulties faced by the legislature (and indeed, the courts) in keeping pace. The legislature should be encouraged to implement the ALRC's proposals in this regard, taking a proactive rather than reactive position. Far better to engage a degree of foresight in preventing genetic discrimination now, than to attempt to curb its employment following widespread implementation.

Genetic Evidence in the Courts

Finally today, I wish to say a few words about the use of genetic evidence in court proceedings. With each passing year, the power of DNA as an evidentiary aid increases. The Innocence Project in the United States

[49] *Convention for the Protection of Human Rights and Dignity of the Human Being with Regard to the Application of Biology and Medicine*, opened for signature 4 April 1997, ETS No 164, entered into force 1 December 1999.
[50] For example, *Disability Discrimination Act* 1992 (Cth); *Human Rights and Equal Opportunities Act* 1986 (Cth); *Racial Discrimination Act* 1975 (Cth); *Sex Discrimination Act* 1984 (Cth); *Workplace Relations Act* 1996 (Cth).
[51] ALRC, note 3 at 293-301.
[52] ALRC, note 3 at 301-312.

demonstrates this most impressively; by July 2003, the project had secured the release of no fewer than 131 convicted offenders on the basis of genetic evidence.[53] In 2001, the Queensland Court of Appeal became the first state court to overturn a conviction based on the emergence by appeal of DNA evidence not canvassed at trial.[54] The trend is summarised by Justice Joseph Walsh of the Supreme Court of Delaware, who writes that "the broadening of our understanding of the human gene will contribute to the increasing controversy over the use of scientific evidence as a litigation tool."[55]

Difficult and particular issues arise in relation to DNA evidence because it is inherently variable in terms of reliability. DNA evidence could be flawed for a number of reasons, including the quantity and quality of the samples,[56] the quality of the testing laboratory[57] and the handling of the samples.[58] Even assuming the physical integrity of the testing process (an assumption itself susceptible to challenge)[59], the presentation of DNA evidence in court remains a delicate issue. For example, considerable literature has been devoted to the so-called "prosecutor's fallacy".[60] The fallacy arises where two probabilities are confused: first, the probability of a DNA match, given that the defendant is innocent, and second, the probability that a defendant is innocent, given a

[53] See http://www.innocenceproject.org.
[54] *R v Button* [2001] QCA 133; CA No 247 of 2000, 10 April 2001.
[55] Justice J Walsh, "The Evolving Standards of Admissibility of Scientific Evidence" (1997) 36(3) *The Judges' Journal* 33 at 33.
[56] ALRC, note 3 at 1092-1093.
[57] ALRC, note 3 at 1093.
[58] ALRC, note 3 at 1093-1094.
[59] See for example the allegations made in *R v Fitzherbert* [2000] QCA 255; CA No 283 of 1999, 30 June 2000. In that case, the appellant alleged that his conviction was the result of deliberate fraud by staff at a forensic laboratory.
[60] See for example B Atchison, "DNA Statistics may be misleading" (2003) *LSJ* 68; D Balding and P Donnelly, "The Prosecutor's Fallacy and DNA Evidence" (1994) *CLR* 711.

DNA match.[61] The matter is not one of mere semantics; the two probabilities address subtly, but distinctly, different questions, and mistaking one for the other has the potential to create an ambiguity in the minds of jurors that impedes the course of justice.

Consequently, two major legal issues arise. The first surrounds the very admissibility of DNA evidence. That question, hotly debated in the United States during the "DNA Wars",[62] appears to have been resolved both in that country and in Australia in favour of admitting the evidence, subject obviously to any specific challenge to the evidence's integrity.[63] However, the second issue is the appropriate manner in which juries should be directed, or warned, about the evidence, and a consensus about that question appears to remain distant.

The ALRC report calls for the introduction of a model jury direction for judges in cases involving DNA evidence.[64] An appropriate jury direction is certainly important; as Matthew Goode, from the University of Adelaide, points out:

> "The highly subjective nature of the mathematical processes remains concealed behind the apparent certainty of a bald statistic. It may also be that the larger the number of loci compared, the higher the statistic, the more need there is for an

[61] See ALRC, note 3 at 1098-1099; D Balding and P Donnelly, note 60 at 716-717.
[62] See T McDonald, "Genetic Justice: DNA Evidence and the Criminal Law in Canada" (1998) 26(1) *Manitoba Law Journal* 1 at 5-6.
[63] ALRC, note 3 at 1092.
[64] ALRC, note 3 at 1106.

> appropriate direction to the jury about what the really impressive statistic really means."[65]

A number of courts have attempted to provide an example of the issues that might need to be addressed in a judge's summing up. The English Court of Appeal formulated a series of not only evidentiary and procedural propositions, but also judicial instructions, relevant to the use of DNA evidence,[66] set out in the headnote of its decision in *R v Doheny and Adams*[67]. There, the court accepted that the following direction might be used:

> "Members of the jury, if you accept the scientific evidence called by the Crown this indicates that there are probably only four or five white males in the United Kingdom from whom that semen stain could have come. The defendant is one of them. If that is the position, the decision you have to reach, on all the evidence, is whether you are sure that it was the defendant who left that stain or whether it is possible that it was one of that other small group of men who share the same DNA characteristics."[68]

Similar comments were expressed in an Australian setting by the Supreme Court of the Northern Territory recently in *R v Latcha*[69]. The propositions set

[65] M Goode, "Some Observations on Evidence of DNA Frequency" (2002) 23 *Adelaide Law Review* 45
[66] For a general discussion of the content of the propositions, see M Goode, note 65 at 61-63.
[67] [1997] 1 Cr App R 369.
[68] Note 67 at 370.
[69] (1998) 127 NTR 1.

out by the Court in that case are more procedural in nature, but much of the substance of the provisions is similar.[70]

The comments of the Supreme Court of British Columbia in *R v Singh*[71] are also instructive:

> "[I]t can be made sufficiently clear to the jury that: 1) the estimates are not intended to be precise; 2) they are the products of mathematical and scientific theory, not concrete facts; 3) they do not purport to define the likelihood of guilt; 4) they should only be used to form a notion of the rarity of the genetic profile of the accused; and 5) the DNA evidence must be considered along with all the other evidence in the case relating to the issue of identification."[72]

On a cautionary note, however, it is worthwhile to acknowledge the sentiments expressed by Doyle CJ of the South Australian Supreme Court recently in *R v Karger*[73]:

> "it is undesirable to impose on trial judges the obligation, as a matter of law, to give warnings to a jury except where that is truly necessary. Any idea that there is no harm in giving a warning, and therefore that it is appropriate to make the

[70] See M Goode, note 65 at 63-66.
[71] (1996) 108 CCC (3d) 244.
[72] Cited in M Goode, note 65 at 67.
[73] Unreported, Supreme Court of South Australia Court of Criminal Appeal, Doyle CJ, Prior and Gray JJ, 30 August 2002.

> warning obligatory, should be rejected … As long as the judge explains to the jury how the evidence may be used, and how it should not be used, there is no need for warnings against its misuse generally, or for a warning against misuses of the evidence that have not taken place in the trial."[74]

Clearly, while the admissibility of DNA evidence now appears to be largely beyond dispute, the manner in which judges should deal with genetic evidence remains a less straightforward question. The concept of a model judicial direction is a sound one. You may be interested to hear the guideline direction devised by the Judges of the higher Courts of Queensland. It reads:

> "You have heard evidence about the deoxyribonucleic acid (DNA) molecule, a double-stranded linear molecule found in the nuclei of the cells of the body. It is wrapped up and folded and packed into the cell; but if it were unravelled it would look like the rungs of a ladder, with the steps being the bonds between complementary base pairs.
>
> The process of identification by DNA profiling is based on the testing of DNA molecules in body tissues and bodily fluids such as blood, saliva, and semen. From measurements taken at selected locations, a DNA profile for a sample of bodily tissue or fluid of unknown origin may be obtained and compared with the DNA profile obtained from a sample of bodily tissue or fluid of known origin. If the profiling tests are done correctly and if

[74] Note 73 at [182].

the profiles match, it may be concluded that the tissue or fluid of unknown origin *could come* from the same person as the person from whom the tissue or fluid of known origin came.

The matching of the profiles does not establish that the tissue or fluid of unknown origin *is* from the person from whom the tissue or fluid of known origin came. There is the possibility that the tissue or fluid of unknown origin came from someone else.

If the tissue or fluid of known origin came from a person with an identical twin, the tissues or fluid of unknown origin could have come from the twin; and it could have come from someone who is not the identical twin. The evidence is that the defendant does not have an identical twin. But the possibility remains that someone else could have a DNA profile which matches his.

The chances of someone's having a matching profile are calculated from statistical studies. If we leave aside the special case of identical twins who have matching DNA profiles, the chances of someone having a matching profile will, if the statistics are reliable, be very small. In this case, the figure of one in [number] was calculated.

The prosecution case rests on the results of analyses of [tissue or fluid of unknown origin] on the [object] found on [date] and a sample of the defendant's [tissue or fluid] supplied on [date].

> Those analyses were made on [date] and, as you have heard, the DNA profiles obtained matched.
>
> The evidence of that matching is the foundation of the prosecution case, but that evidence will be worthless if the matching resulted from contamination of the [tissue or fluid of unknown origin] by the defendant's [tissue or fluid]. In that event the DNA profile of what appeared to be the [tissue or fluid of unknown origin] would have matched the defendant's [tissue or fluid] sample because some of the defendant's [tissue or fluid] had been mixed with the [tissue or fluid of unknown origin] swamping it, and thus giving a false matching: the DNA profiles would have matched because they both were of DNA molecules in the defendant's [tissue or fluid]." [footnotes omitted]

Yes, it is true, we expect a lot of jurors, and I am confident they deliver!

It is topical finally to note the need to be careful in this area with statistical evaluation of probabilities; I have in mind the current controversies in the United Kingdom over murder convictions concerning deaths attributed to SIDS and the evidence of Sir Roy Meadow. We must in the area of DNA be astute to avoid a risk of juries' being dazzled by statistics, or distracted from a dispassionate assessment of evidence.

Conclusion

Genetics is certainly an area warranting the attention it receives, from members of the legal profession as much as from their medical colleagues. The ALRC report provides a comprehensive summary of the pressing issues, and an outline of proposed solutions. The report goes a long way towards addressing the issues, but it also reminds us that there remains much to be done in terms of regulating genetics in this country.

Ultimately, and unfortunately, there is no absolutely correct or incorrect answer to the difficult questions I have raised today. In each case, the issue must be approached by rationally weighing competing considerations and reaching a balanced compromise. Comments made by Tony Blair epitomise the challenge:

> "The most important thing for us is to try and get the balance right between the role of science and the role, if you like, of society or governments. The role of science is to inquire and to discover, and it's the role of society and government on behalf of society to make judgments about what we then do, how we respond."[75]

This is indeed a confronting challenge, not least from a judicial perspective. For the challenge is one that, in large part, will be addressed by the courts. The current debate represents an important, indeed necessary contribution to the development of a framework by which judges may properly arrive at their

[75] Prime Minister T Blair, quoted in CNN, "Burden of Proof: Can Law Catch Technology in Race to Unlock Biological Secrets," available at http://www.cnn.com/TRANSCRIPTS/0006/26/bp.00.html.

decisions. I made the following comments two years ago in delivering the annual General Sir John Owen Oration at the United Services Club in Brisbane:

> "The impact of these arresting medical advances, their wonderful potential for good, their terrifying capacity for evil, remains to be seen. My point … is that questions of legal rights will undoubtedly command court consideration. If such new fields are given at least "framework" legislative treatment, your (unelected) judges will be able to provide optimal judicial leadership, which I would regard as leadership most aptly reflecting broad "community values" – assuming they may be accurately discerned."[76]

While those comments were made in relation to stem cell research, they are equally apposite to the topic of genetics. Inevitably, judges will face difficult questions in coming years about genetics, and their ability to reach decisions that appropriately reflect community sentiment will be determined partly by the legislature's progress in this field. Even partial implementation of the ALRC's recommendations would represent a major step forward in providing a solid basis for regulation. A determined collective attitude from the law, medicine and government in this area should ensure that the astounding potential benefits offered by genetic research are not outweighed by the costs.

[76] Chief Justice P de Jersey, "Judicial Leadership in Changing Times," General Sir John Owen Oration, 26 October 2001 at 12. Available at http://www.courts.qld.gov.au/publications/articles/speeches/dj261001.pdf.