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To Clear or To Convict? The Role of Genomics in Criminal Justice[1]

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> *JUDGE SLATER: Look, I have signed hundreds of search warrants for Captain Brass, but ... this affidavit lacks probable cause. Prints on quarters, an admixture of DNA...*
>
> *GRISSOM: DNA, if given a warrant, will clear or convict...*
>
> *JUDGE SLATER: ... are not enough for me to invade the Klinefelds' right to privacy*
>
> CSI: Crime Scene Investigators, Assume Nothing (part 1)[2]

Introduction

Although the title 'genomics and criminal justice' opens a relatively wide field of inquiry, this paper is primarily concerned with the use of genomic technologies by the criminal justice service(s), with a particular focus on the use of DNA and DNA databases. The vehicle for this exploration will, for the most part, be the National DNA Database of England & Wales.

The above exchange between a Judge and a law enforcement official, though taken from fiction, highlights the two key issues raised by the use of DNA and DNA databases in the criminal justice setting that will be considered in this paper. Firstly, we see the portrayal of DNA as a powerful tool that will serve as the lynch pin of the investigator's case; secondly, we see the Judge's concern for the 'privacy' of the suspects. In this context, these two concepts – the utility of DNA and the privacy of the individual – are conflicting. These competing interests are mediated by a governance process of law and policy – represented in the above exchange by the need to satisfy the test of 'probable cause' before a warrant can be issued. By exploring the interaction between these conflicting notions of utility verses privacy, it is hoped that a theoretical framework of principles for governing the use of DNA by the criminal justice service can be extrapolated. Are concerns about privacy warranted, if the utility of the data is so strong?

Utopia verses Dystopia

In 1943 the physicist Erwin Schrödinger began to explore the workings of the living organism from what he described as a 'naïve physicist's approach'.[3] Through applying his knowledge of physics, chemistry and quantum physics he postulated that the molecules of the body must contain the script or design for the human body, which must necessarily be responsible for the functioning of the structure of the organism. Further to this he suggested these molecules must somehow be involved in the heredity process studied by geneticists. In essence, he predicted the existence of DNA and challenged his colleagues in the biological sciences to find it.

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Nearly twenty years later, James Watson and Francis Crick were awarded the Nobel Prize in Physiology or Medicine[4] for their discovery – first published in a letter to *Nature* on the 25 April 1953[5] – of the double-helix structure of DNA. In 1983, thirty years after Watson & Crick's paper was published and forty years after Erwin Schrödinger's prediction, a 15 year old schoolgirl was raped and murdered in the English town of Narborough in the county of Leicestershire. Three years later a second schoolgirl was found murdered and sexually assaulted. At the time, it was not unusual to test samples found at a crime scene for blood type, but the notion of a DNA fingerprint had only recently been discovered, and had never been applied in the context of a criminal investigation.[6] The police officers investigating the murders were convinced that the two crimes were connected (because of the matched blood-type and the *modus operandi* of the crime). They arrested a suspect who gave an apparently false confession to the second murder, while denying involvement in the first. In an effort to link the suspect to both murders, the Police took the unusual step of approaching Professor Sir Alec Jeffreys at Leicester University, who had developed the scientific process of 'DNA fingerprinting' the previous year.[7] The results of the tests carried out by Professor Jefferys exonerated the suspect, and provided police with a 'DNA fingerprint' of the actual murder. In the absence of any existing database of DNA samples, the Police conducted an 'intelligence led screening' of over 5,000 men in the local area. Eventually, this process led to the arrest of a local baker named Colin Pitchfork, his DNA profile was matched with the semen from both murders and in 1988 he was sentenced to life for the crimes.[8] The purpose of this ad hoc history lesson is to place DNA and its forensic use in its historical context. Neither DNA, nor its forensic uses are new ideas.

The advent of new scientific or technological developments is often met with conflicting reactions. The same is true for developments that could be seen to be new applications of an older technology. As the science of DNA and DNA databases continues to develop, with its forensic applications continuing to rise, it would seem that it attracts both champions and critics. This phenomenon has been observed in many contexts and is not always useful. As Gordijn observes, with reference to developments in nanotechnology, *'[t]he dominance of utopian dreams and apocalyptic nightmares in the debate on future perspectives of [new technology] holds the risk of unnecessary backlashes. These radical views are the product of one-sided perspectives.'*[9] Although, this extract refers specifically to debates surrounding nano-technology, the tendency to pit utopia against dystopia is common in the framing of debates surrounding new technologies. These visions of the future traditionally demonstrate either a great promise, or a great danger from a new technology. They may be based on science fact, such as published scientific data, or, they may be projections of future developments - truly a vision as opposed to a reality. Many of the key narratives in these proposed futures may be drawn from science fiction or have become the subject of science fiction. How then do we distinguish scientific truth from fiction? In the case of forensic uses of DNA, the popularity of 'forensic science fiction' shows such as CSI: Crime Scene Investigators and its various spin-off and competing shows, appears to be proliferating an apparently positive utopian view of the value of these technologies, leading to what has been termed the 'CSI effect.'

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When this concept of a 'CSI effect,' already popular in the media, was presented to the American Association for the Advancement of Science (AAAS) during a symposium in February 2005, it prompted a further flurry of testimonials in the media. The presenter Dr. Max Houck suggested '*the CSI effect is basically the perception of the near-infallibility of forensic science in response to the TV show. […] This TV show comes on and everyone starts watching it - including the cops and prosecutors - and submissions to forensic laboratories go through the roof'*.[10]
In addition to this increase in the workload of forensic science labs, the so-called 'CSI effect' has had a number of other tangible impacts. Another participant at the symposium, Dr Patricia McFeeley observed that '*survivors are often dissatisfied with the investigation into the death of a loved one, demanding more forensic evidence. […] The perception is that the medical examiner isn't doing all the things they see on TV. They expect toxicology results to be instantaneous, instead of taking months, which is the reality…They want everything to be tested at a crime scene when it is not warranted by the facts or by the fiscal realities of the lab*'.[11] This apparent perception of the power of forensic science generally, and DNA based evidence specifically, has also reportedly had an impact on the way that juries deliberate. This is evident in the statement of a reporter that because of '*[the CSI effect] juries from coast to coast expecting fancy forensic evidence that will seal a defendant's guilt or innocence.*'[12]
The suggestion is that the utopian view of forensic science portrayed through popular media is causing juries difficulty when deciding on guilt. In the UK and the USA, for a jury to return a guilty verdict in a criminal trial the prosecution must have proved guilt 'beyond reasonable doubt'.[13] In contrast, in the UK, the test for guilt or liability in a *civil* court (such as a claim for negligence or breach of contract) is the less stringent 'balance of probabilities test'.[14] There have been many examples reported in the media[15] of decisions that are attributed to this CSI effect causing juries to be reliant on the 'juggernaut of infallible evidence'[16] that is presumed to be held by forensic science. One reported example is the murder trial of Robert Blake, in which jurors, after returning a 'not guilty' verdict, are said to have asked '*why didn't they try to get some DNA, or hair or something, off the jacket?… It would, above all, eliminate the need to figure out whether the prosecution had proven its case 'beyond a reasonable doubt*'.[17]

Thus we are faced with the possibility that in the minds of potential jurors forensic evidence, specifically DNA evidence, is the key indicator of guilt 'beyond reasonable doubt'. The reality of the impact of the 'CSI effect' on the criminal justice system remains to be seen. A recent review article, in the Yale Law Journal, explores the possible social and psychological effects that television shows such as CSI has on jurors. It concludes '*the* CSI *effect has become an accepted reality by virtue of its repeated invocation by the media. Although no existing empirical research shows that it actually occurs, on a basic level it accords with the intuitions of participants in the trial process.*'[18] Additionally, we might consider that regardless of the motivation for a juror's decision, an acquittal or conviction by a jury of one's peers is a simple function of the administration of justice. In contemplating the media articles that attribute various convictions and acquittals to the CSI, it is difficult not to remember the adage known as the *Blackstone Ratio* that it is '*better that ten guilty persons escape than that one innocent suffer*'.[19] For if the jurors remain unconvinced by the evidence before them, when burden of proof is one of 'beyond reasonable doubt', they have no option but to return a not guilty verdict.

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Regardless of the weight that the presence (or absence) of DNA evidence might carry in the court room, the fact remains that DNA evidence appears to be a powerful aid to those investigating crime. Professor Sir Alec Jeffreys, the architect of DNA fingerprinting, is reported to have said '*it does not solve crimes. It establishes whether sample X comes from person Y, it is up to the court to interpret that in the context of other evidence in a criminal case*,'[20] which upholds the idea of DNA as an *aid* in investigations, rather than a conclusion. Arguably, the evolution from 'intelligence led screening' and matching individual samples against individual suspects in custody towards a more developed database system seems only logical, so as to provide the greatest possible range of samples to be matched against the greatest possible range of people. In 1995 the establishment of the National DNA Database (NDNAD) in the England and Wales was a world first (at present there is a separate database for Scotland & Northern Ireland, although they submit profiles to the NDNAD). Both locally and globally, databases that store genetic or genomic data are created for many purposes – including medical research and criminal investigation, and contain varying amounts and types of data, meaning that every database or biobank is different. Some are children of legislation, created specifically by statutes that specify the exact parameters of the database in question. Others are created independently of statute or statutory instrument, and must interact with existing laws and regulatory frameworks. The latter form of databases or biobanks may require the development of new or amended regulations after the fact.[21]

The NDNAD is not a 'child of legislation', in that there is no specific 'National DNA Database Act' which established the database, and defined what details may be stored in it or how it may be used. Instead, the database was created as a result of The Criminal Justice and Public Order Act 1994[22], which, through amendment of the Police and Criminal Evidence Act 1984[23] established the conditions that would allow the database to be created. Essentially this was achieved by relaxing the rules relating to the collection, retention and use of 'non-intimate samples'[24] and, to a lesser extent, 'intimate samples'.[25] Such samples, would often (though not exclusively), be used for DNA profiling. Various acts of parliament[26] have further expanded the powers of the police in relation to such samples. This has had the (intended) effect of increasing the size of the NDNAD, and thus presumably increasing its power as an investigative tool (providing a still larger group of persons to compare to a still larger group of samples). The Office of Science & Technology observes, '*the progressive widening of police powers to take samples from suspects together with the permitted retention of samples and profiles, irrespective of whether an individual is acquitted or not charged, has resulted in a big expansion of the Database*'.[27] It is this recent amendment, to allow the retention of samples from anyone arrested for a 'recordable offence', regardless of whether or not they have been charged, which appears to have caused the most controversy. One of the most highly cited reports which details the various problems and concerns raised by the National DNA Database, is that produced by GeneWatch UK in January 2005.[28] In addition to a review of the current scientific and legal status of the NDNAD, the report considers the issue of the protection of Human Rights and civil liberties, of which privacy and issues related to privacy appear to be the most important. Interestingly, a large section of the report considers the potential developments in the field of forensic DNA testing and considers potential future uses of the NDNAD.[29] Many of these 'future' concerns relate to the genetic privacy of the individuals whose data is stored on the database and to the

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overall use of the data for purposes other than that originally intended. The report's executive summary states:

> *'The current DNA data used for identification purposes contains very limited information about a person's genes. However, this may change in the future with plans to use new technology to exploit the information in DNA samples. Some advocates have argued that this technology will be able to predict the characteristics of a suspect from the DNA evidence at the scene of a crime, generating a description along the lines of 'a tall man, with red hair, blue eyes, who's probably overweight'. Researchers are also looking at predicting ethnicity and health status. Some even believe it will be possible to predict a person's personality or behaviour. However, there are serious scientific problems with most of these approaches. Not only is some of the research fundamentally flawed, much of it is unlikely to produce particularly useful or accurate predictions. There is also a danger that the information will be used selectively to reinforce existing prejudices, for example about race or skin colour. Nevertheless, a few genetic tests can reveal important information about some people's health. If use of this new technology were expanded to stored samples from known individuals on the database, the increase in police access to genetic information could pose an even greater threat to privacy.'*

Thus it seems that these fears are contemplating a vision of a future where forensic databases, such as NDNAD, develop powers that are concerned with decoding genetic genomic material, rather than comparing and contrasting samples. These 'genome focused' applications each have many potential uses and potential perils. As Onay explains, there is an inherent danger in placing too much faith in the thesis of genetic determinism – particularly as regards personality or behaviour – within a criminal justice setting. He comments that '*jurisprudential reactions to research into genetic criminality have been based on misinformation and consequently have exaggerated the ramifications of this research for the criminal justice system*'.[30] Concerns about the possible misuse of this data are thus perhaps located within this confusion that Onay highlights. Is it really a concern that if (in the future) the police had the ability to screen for genetic indicators of personality, they might assume these to be definitive indicators of guilt or innocence? Or at least a propensity towards a certain kind of behaviour. Nevertheless, as Franz Joseph Gall noted in relation to his creation of phrenology as a (now debunked) science to determine behaviour, '*it is only this struggle against the propensities which gives rise to virtue, to vice, and moral responsibility. What would that self denial, so much recommended, amount to, if it did not suppose a combat with ourselves ? and then, the more we multiply and fortify the preservatives, the more man gains in free agency and moral liberty*'.[31] Perhaps then, any concern about the use of such information must be related to its misuse (the use for purposes other than the genuine detection and deterrence of crime), or perhaps more accurately to its misinterpretation.

In addition to comments on privacy, the Genewatch report suggests that:

> *'Other national databases are being planned and developed, including the National Identity Register to support the use of ID cards, and the new NHS Electronic Care Record Service, which may contain some genetic data in the future. It is not clear under what*

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> *circumstances the police will be allowed access to this information. Nor is it clear whether any of these databases will be linked, possibly allowing other Government bodies to find out who is on the NDNAD. Expanding and/or linking these databases would give the state unprecedented abilities to monitor the UK population, greatly increasing the threats to our privacy. There are concerns that this access could all too easily be abused, taking the UK closer towards an oppressive 'police state.'*[32]

It has already been suggested that it is common to see debates on new (or improved) technologies polarized around opposing utopian or dystopian visions of the future. Interestingly, the same potential advances might be used to support opposing arguments. For example, the proposed future occurrence of DNA evidence at the scene of a crime, generating a description along the lines of 'a tall man, with red hair, blue eyes, who's probably overweight', could potentially be a useful tool in the identification of suspects where a DNA sample is found at a crime scene that does not match an existing profile in the database. However, when considering the reality of the technology in question, Haga suggests that

> *'[i]n comparison to the quantitative preciseness and accuracy of the 13-marker core STR DNA identification profile, AIMs and genetic markers associated with ancestry and physical or behavioral traits appear to be far less reliable for identification purposes. Regardless of the validity of this technology or whether it will be useful to forensic investigators, expanded genome profiling will pose major challenges in its use.'*[33]

It seems that when contemplating the application of new (or improved) technologies, we are being asked to perform a number of balancing acts. The first is to balance the various utopian and dystopian visions to establish a grasp on the reality of the science as it is today, and to arrive at a balanced vision of the science that may be tomorrow. I would suggest that it is the consideration together of science fact alongside 'science potentia' (as distinct from science fiction), that is the most important starting point to any governance analysis of a new technology. Thus whilst utopian and dystopian visions of the future can often have the effect of polarising debates, in the early stages of the debate their presence is perhaps vital to allowing the framing of the debate and therefore facilitating this balancing process.

Does size matter?

As research continues into the potential viability and impact of expanded uses of DNA by the Criminal Justice, the fact remains that – for now – the role of DNA fingerprinting and the DNA database is still that it 'establishes whether sample X comes from person Y'. It is the police who solve crimes, and the courts who convict. The NDNAD is the largest DNA database for criminal justice purposes in the world, with a reported 3.45 million (representing about 5.2% of the UK population) profiles and 263,923 crime scene sample profiles as of the end of December 2005.[34] Notwithstanding any potential - positive or negative - skew of conviction rates for 'CSI Effect', the utility of this database seems apparent. The National DNA Database Annual Report 2004–2005 contains a large amount of data which points to the efficacy and utility of the NDNAD.[35] The table reproduced below (Table 1) indicates the number of matches of crime scene samples, to suspect(s)' DNA profiles.

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Table 1: Crime Scene – Suspect Matches[36]

	1998/99	1999/2000	2001/02	2002/03	2003/04	2004/05
DNA Matches	21.239	23,021	30,894	49,913	45,269	40,169

To help interpret this data, the Annual Report explains that:

> *'matches between a crime scene and a subject are useful in identifying possible suspects for the offence. Since May 2001, 195,779 crime scene profiles have been matched with 157,096 separate individuals. For 126,883 of the crime scene profiles, a single suspect was reported. For the remainder, a list of potential suspects was produced. The identification of more than one potential suspect as the source of the DNA at some scenes is largely due to the significant proportion of crime scene sample profiles that are partial…The number of crimes with DNA matches rose from 23,021 in 1999-2000 to a peak of 49,913 in 2002/2003 (a 74% increase) before falling to 45,269 in 2003/2004 and then to 40,169 in 2004/2005. The fall in DNA matches after 2002/2003 broadly correlates with the fall in the total number of recorded crimes over the same time frame (i.e. fewer crimes, fewer crime scenes being visited, and fewer crime scene sample DNA profiles being loaded, leading to fewer matches).'*[37]

To place these figures in further context, the table below (Table 2) – reproduced from home office figures published by the Office of Science & Technology[38] – purports to demonstrate the impact of DNA on crime detection. The first column represents the overall percentage of crime detected, whilst the second column represents the percentage of crimes detected where DNA crime scene samples are loaded on the Database (the term detected, is taken to mean solved in this context).

Table 2: Crime Detections

Crime Category	National Crime Detection Rate	DNA Detection Rate
All recorded crime	26	40
Domestic Burglary	16	41
Non-domestic Burglary	11	50
Theft of Vehicle	15	24
Theft from Vehicle	8	63
Theft from vehicle	14	51

The implication is that, crimes are more readily solved if there is DNA evidence. The House of Commons Science & Technology Committee comment that '*DNA evidence now represents a vital instrument for facilitating investigations and securing convictions. We believe that the recent expansion of the database would make a review of the impact of the NDNAD on the detection and deterrence of crime timely.*'[39] It would seem that it is necessary to establish the realities of this impact, and take care that current figures are not creating a 'real life' CSI: Effect.

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Assuming the results of such an investigation were positive, and showed that the NDNAD was indeed leading to an improvement in the detection and deterrence of crime, then logic would suggest that a larger database would have a larger impact on the detection and deterrence of crime.

Moreover, there are other uses to which the NDNAD, and others like it, fall under the auspices of the criminal justice service, but do not relate directly to the detection and deterrence of crime. Consider for example, the events of September 11th 2001, December 26th 2004 and July 7th 2005. The terrorist attack on the World Trade Centre in New York, the Boxing Day Tsunami in the South Pacific and the terrorist attacks on the London transport system have all proved a particular challenge for the criminal justice services in relation to their use of various forensic technologies, not simply for the need to identify the remains of suicide bombers in the aftermath of terrorist attacks, but also because of the need to identify the countless left dead in the wake of such attacks and natural disasters. Before the end of the day on September 11th 2001, the US company Genecodes was asked to take the lead in developing a system to assist in the identification of 20,000 human remains, linking them to samples collected from family members and personal items. This would later lead to the development of the Mass-Fatality Identification System [M-FISys].[40] It is possible that the existence of a large-scale database of some kind might have assisted in the identification of the deceased more readily. Newspaper reports from the time of the Boxing Day Tsunami and the 7th of July London bombings[41] point to DNA as being the 'gold standard' for identification, but highlight the difficulties, and limited usefulness, of DNA profiling in 'disaster' situations where there is a lack of infrastructure. The indication would be that whilst DNA testing is hard to perform without a laboratory, fingerprinting and dental records can be compared by simpler means, although DNA remains the gold standard.

Not Guilty verses Not Retained

We have seen a gradual expansion of police powers relating to the collection, retention and use of DNA and related samples. As Kaye observes, this increase in powers appears directly related to this perception of the utility of the science:

> *'As forensic techniques continue to improve, reports on the success of the police in using DNA analysis for solving past and present criminal cases are becoming an everyday occurrence in the media. The importance of DNA analysis as a police investigative tool is also increasingly evident in the 'fight against terrorism' which has resulted in increased police powers. There are two avenues by which police can collect and obtain access to DNA samples. The first is through the Police and Criminal Evidence Act 1984 (PACE) and its amending legislation,[42] that allows the police to forcibly collect samples in some situations. The second is through an access order granted by the court, which allows access to samples from existing collections held by other parties.'*[43]

One such expansion, under s84 of the Criminal Justice and Police Act 2001, effective as of May 2001, allowed for the retention of samples of those who had been acquitted of the crime of which they had been accused when the sample was first taken. In this situation, 'the fingerprints or samples may be retained after they have fulfilled the

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purposes for which they were taken but shall not be used by any person except for purposes related to the prevention or detection of crime, the investigation of an offence or the conduct of a prosecution'.[44] Prior to this point in time, such samples ought to have been destroyed upon acquittal, exoneration or failure to prosecute. The Criminal Justice Act 2003 further extended these powers 'to allow a non-intimate sample to be taken without consent', where 'the person is in police detention in consequence of his arrest for a recordable offence'.[45] In this context, a 'recordable offence' is defined as any offence 'punishable with imprisonment and any offence specified in the Schedule [to The National Police Records (Recordable Offences) Regulations 2000]'.[46] The interaction of this provision with the earlier amendment, means that anyone who is arrested (for a recordable offence) can have their DNA added to the NDNAD, and that sample may be kept and used in the same way as the sample belonging to a person who was charged, but not convicted. Thus the DNDAD has been expanded to include not just the DNA of convicted criminals and volunteers who have given written consent, but also those who might simply have been in the 'wrong place at the wrong time'. Interestingly, the House of Commons Select Committee on Science and Technology, identified a need for further independent research into 'public attitude towards retention of DNA samples (both from convicted criminals and others), and the evidence of benefits associated with this practice'. They also make comments on the need for greater ethical oversight of the database and stakeholder scrutiny of the database.[47] This suggests some potential discomfort with the idea of continuous retention of samples.

In a briefing paper published in June 2005, Genewatch suggested that

> *'few people have problems with the idea of the police comparing the DNA of a suspect with DNA left at the scene of a serious crime. However, concerns arise when DNA profiles and other information are stored permanently on a database, especially when the database includes large numbers of innocent people. The three main areas of concern about the NDNAD are: its impacts on people's privacy; the potential for misuse by governments; and whether it discriminates against certain groups of people.'*[48]

In response to these concerns, two (conjoined) judicial review cases *R v. Chief Constable of South Yorkshire Police ex parte LS (by his mother and litigation friend JB)* and *R v. Chief Constable of South Yorkshire Police (Respondent) ex parte Marper* reached the House of Lords in July 2004.[49] The central question in both cases was whether the amended provisions of 64(1A) were compatible with the European Convention on Human Rights - as incorporated into UK Law by the Human Rights Act 1998 - and in particular with the Convention rights contained in articles 8 (Article 8: Right To Respect For Private And Family Life)[50] and 14 (Prohibition Of Discrimination)[51]. The appeal of both parties was dismissed. Lord Steyn, delivering the main judgement, explored the nature of DNA and the NDNAD, and appeared content with their utility, recognising them as powerful tools. He stated in opening:

> *'It is of paramount importance that law enforcement agencies should take full advantage of the available techniques of modern technology and forensic science. Such real evidence has the inestimable value of cogency and objectivity. It is in large measure not affected by the subjective defects of other testimony. It enables the guilty to be*

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> *detected and the innocent to be rapidly eliminated from enquiries. Thus in the 1990s closed circuit television (CCTV) became a crime prevention strategy extensively adopted in British cities and towns. The images recorded facilitate the detection of crime and prosecution of offenders. Making due allowance for the possibility of threats to civil liberties, this phenomenon has had beneficial effects.'*

The use of fingerprint evidence in this country dates from as long ago as 1902. In due course other advances of forensic science followed. But the dramatic breakthrough was the use of DNA techniques since the 1980s. The benefits to the criminal justice system are enormous. For example, recent Home Office statistics show that while the annual detection rate of domestic burglary is only 14%, when DNA is successfully recovered from a crime scene this rises to 48%. It is, of course, true that such evidence is capable of being misused and that courts must be ever watchful to eliminate risks of human error creeping in. But as a matter of policy it is a high priority that police forces should expand the use of such evidence where possible and practicable.'[52]

Thus it seems that, Lord Steyn, in his opening arguments, before describing the legal deliberations relating to the European Convention, has performed the balancing of Utopian and Dystopian visions. He considers the apparent value of the database, contrasts it with other technological developments, and considers the concerns of data misuse. Later in the case, testimony from Liberty – that had been granted permission to intervene when the case(s) were heard in the Court of Appeal –further highlighted these concerns, indicating that 'the range of genetic information that may be derived from DNA *samples* is of a highly private nature' and suggested that '*the samples provided more information about the person who provided the samples than is needed for the identification of those involved in crime*'.[53] Lord Brown of Eaton-under-Heywood appeared to engage with the utopia/distopia analysis with even more vigour. He agreed with Lord Steyn's legal reasoning, but added by way of *obiter dicta*:

> *'Given the carefully defined and limited use to which the DNA database is permitted to be put—essentially the detection and prosecution of crime—I find it difficult to understand why anyone should object to the retention of their profile (and sample) on the database once it has lawfully been placed there. The only logical basis I can think of for such an objection is that it will serve to increase the risk of the person's detection in the event of his offending in future. But that could hardly be a legitimate objection, nor, indeed, is it advanced as such. Such objections as were suggested, however, seem to be entirely chimerical. First, the fear of an Orwellian future in which retained samples will be re-analysed by a mischievous State in the light of scientific advances and the results improperly used against the person's interest. If, of course, this were a valid objection it would apply no less to samples taken from the convicted as from the unconvicted and logically, therefore, it would involve the destruction of everyone's samples. But no such abuse is presently threatened and if and when it comes to be then will be the time to address it. Sufficient unto the day is the evil thereof.'*[54]

In this passage, Lord Brown of Eaton-under-Heywood directly addresses the 'police state' and the possible abuse – by whatever means- of the database by a 'mischievous state' that appear in what I have characterised dystopian literature.[55] However, he

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does not suggest that such developments are to be encouraged, equally he does not suggest they be ignored, simply that they are neither a real, nor present danger. Moreover, he later advocates further expansion of the database, following similar logic to the argument that a larger database would have a larger impact on the detection and deterrence of crime.[56] It is interesting that one of appellants in this case was a minor. A recent study by Levitt & Tomasini showed that '*the parents and children in this study supported the existence of a NDNAD and its use to solve crime. However, they had reservations about samples being taken for petty crime, were critical where there was a lack of parental involvement and felt that there are dangers of stigmatising young people for a one-off act*'.[57] The concept of stigmatisation links closely with the discussions of discrimination and privacy that were discussed in the case that was heard before the House of Lord's. Is this fear more closely tied to the way that the data might be used or misused in the future than to concerns about privacy? Again we return to the idea (as valued by the parents and children in the Levitt & Tomasini study) that the NDNAD is a useful tool, and but again there seems to be some underlying concern, or lack of trust, that the database will be used properly.

The Principles of Naivety and Community

As we explore the impact of the NDNAD, and by association other databases designed for the same purpose, we are faced with complex utopian visions of a criminal justice service armed with an all powerful database for the benefit of society, contrasted with the dystopian vision of a criminal justice service, armed with the identical, all powerful database intent on mischief to our detriment. As has been suggested, in the absence of clairvoyant abilities, we must navigate these conflicting visions of the future to arrive at that vision which we believe most likely to become reality. The nature of this balancing process can, and frequently does, result in the rationale polarisation of arguments (for better or for worse) around one of the poles of the debate – in favour or against a particular technology.

Chadwick and Berg have suggested, in relation to genetic database initiatives designed for research purposes, that

> *'Genetic database initiatives have given rise to considerable debate about their potential harms and benefits. The question arises as to whether existing ethical frameworks are sufficient to mediate between the competing interests at stake. One approach is to strengthen mechanisms for obtaining informed consent and for protecting confidentiality. However, there is increasing interest in other ethical frameworks, involving solidarity — participation in research for the common good — and the sharing of the benefits of research.'*[58]

Similarly Harris suggests a potential 'moral imperative' to contribute to research, resulting, in part, from the benefits – both explicit and implied – that we receive from living in a society that conducts scientific research[59]. Could such ideas be equally important when considering the principles and frameworks for databases designed for use by the criminal justice service?

If it is true, as per Lord Brown of Eaton-under-Heywood, that *'the more complete the database, the better the chance of detecting criminals, both those guilty of crimes past*

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and those whose crimes are yet to be committed. The better chance too of deterring from future crime those whose profiles are already on the database', can it not then be shown that all members of society would benefit from this reduction in crime. In creating such benefits does this not develop a moral imperative to donate your sample to such a database, so as to create the most powerful database possible? The danger with this line of reasoning is that in pursuit of our supposed utopian criminal justice system we might end up justifying measures that result in the despised dystopia.

Thus any proposed moral imperative to donate a sample to a DNA database designed for use by the criminal justice service must be subject to some safeguards of the participants' rights. Yet these notions, that are communitarian in nature, would always require the surrender of some right or privilege, in return for some community or societal benefit. Is it the case then that the risk of the misuse of data, or the persecution of unfortunate individuals on the basis of genetic information, is acceptable? My response is no, it is not. However, some reduction in the rights and privileges of the individual, as regards individual privacy, is acceptable in the pursuit of a more powerful database, designed to bring about the societal gain of a reduction of crime (or other benefits such as an ability to identify a hitherto unidentified corpse). Perhaps, in this context, it is necessary to consider the rights of the 'innocent' and not the individual as sacrosanct.

In response, I suggest the following model, which I have termed the 'Naïve Position' as the starting point for navigating the complex network of competing interests.

If it can be shown that (a) the innocent have nothing to fear; and
(b) that society has much to gain,

then the application of the technology in question is acceptable.

The careful application of this model once again requires the careful consideration and balancing of utopian ideals against dystopian concerns to identify the reality of the effect that the technology concerned will have on 'the innocent'. This in turn must then be balanced against overall societal benefits, and appropriate safeguards must then be put in place to facilitate both the protection of the innocent and the gain of society.

Perhaps this becomes impossible to realise, as too many competing interests neutralize any possible benefit. Perhaps it is the case, with forensic DNA databases and other genomic technologies, that is not the principle of a technology, but the method of its application that causes problems. For example, there would likely be a marked benefit to be gained from a population wide genetic database for the criminal justice service (particularly in terms of its impact on detection and deterrence of crime), but that benefit is open to abuse. It is desirable that the criminal be apprehended, or better still that the potential criminal be deterred from offending. However, we remain unable to safeguard the innocent by ensuring such a database is used for no other purpose – either now or in the future – than 'to establish whether sample X comes from person Y'. In essence, we remain to unable to navigate between the competing visions of the future.

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[1] This paper is developed from 'Balancing Powers: Some Thoughts on Forensic DNA Databases', a public lecture presented by the author as part of the 'Deciphering DNA' event organised by the Wales Gene Park, Techniquest and the Progress Educational Trust on the 19th July 2005.

[2] This exchange is transcribed from CSI: Crime Scene Investigators, Season 4, Episode 1, Assume Nothing (Part 1).
A full transcription of the script is available online at: http://www.webphilia.com/~anthology/wnp.html.

[3] Erwin Schrödinger, What is Life? What is life? The Physical Aspect of the Living Cell, 1944

[4] Watson & Crick were awarded the The Nobel Prize in Physiology or Medicine 1962 "for their discoveries concerning the molecular structure of nucleic acids and its significance for information transfer in living material", they each received one third of the prize, sharing it with Maurice Wilkins. For more information see: http://nobelprize.org/medicine/laureates/1962/index.html.

[5] Watson J.D. and Crick F.H.C. A Structure for Deoxyribose Nucleic Acid. Nature 171, 737-738 (1953).

[6] Jeffreys AJ, Wilson V, Thein SL. Individual-specific 'fingerprints' of human DNA. Nature. 316, 76–79 (1985).

7 Jeffreys AJ, Wilson V, Thein SL. Hypervariable 'minisatellite' regions in human DNA. Nature.314:67–73 (1985).

[8] This account of the Colin Pitchfork investigation is drawn from the Case Report of the Forensic Science Service available online at: http://www.forensic.gov.uk/forensic_t/inside/news/list_casefiles.php?case=1.

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[10] Rincon, P. CSI shows give 'unrealistic view', BBC News 21/02/2005 at: http://news.bbc.co.uk/1/hi/sci/tech/4284335.stm.

[11] Amarelo, M. Pathologists Say TV Forensics Creates Unrealistic Expectations, AAAS News Release, 21/02/2005 at: http://www.aaas.org/news/releases/2005/0221csi.shtml.

12 Smardz, Z, The Jury's Out: How 12 Reasonable People Got Hung Up on Reasonable Doubt, Washington Post 26/6/2006: http://www.washingtonpost.com/wp-dyn/content/article/2005/06/25/AR2005062500078.html?referrer=emailarticle.

[13] For a statistical analysis of the concept of reasonable doubt, see:
A.R. Gardner-Medwin, What probability should a jury address? Significance 2:9-12 (2005)
In the UK, the Judicial Studies Board (JSB), suggests the following is sufficient instruction for the jury from the Judge: *'How does the prosecution succeed in proving the defendant's guilt? The answer is - by making you sure of it. Nothing less than that will do. If after considering all the evidence you are sure that the defendant is guilty, you must return a verdict of 'Guilty'. If you are not sure, your verdict must be 'Not Guilty'*. In addition, they highlight that: '*Normally, when directing a jury on the standard of proof, it is not necessary to use the phrase 'beyond reasonable doubt'. But where it has been used in the trial, e.g. by counsel in their speeches, it is desirable to give the following direction: 'The prosecution must make you sure of guilt, which is the same as proving the case beyond reasonable doubt': see R v Adey, unreported (97/5306/W2), where the Court of Appeal cautioned against any attempt at a more elaborate definition of 'being sure' or 'beyond reasonable doubt'. Similarly in R v Stephens (2002) The Times, 27 June the CACD said that it was unhelpful to seek to distinguish between being 'sure' and 'certain''*. For more detailed discussion of JSB Guidelines in Criminal Trials see: http://www.jsboard.co.uk/criminal_law/cbb/mf_02.htm#02.

[14] This is usually a simpler formula, of on a balance, the arbiter of fact (whether judge or jury) is satisfied that there is a greater than 50% chance that one proposition is true. See also, Miller v. Ministry of Pensions (1947) 2 All E.R. 372.

[15] For additional examples see: Willing, R CSI Effect' Has Juries Wanting More Evidence, USA Today, 8/5/2004 at: http://www.usatoday.com/news/nation/2004-08-05-csi-effect_x.htm.
and: Roanne, K, The CSI Effect, US News & World Report 25/04/2005 at: http://www.usnews.com/usnews/culture/articles/050425/25csi.htm.

[16] Amarelo, M. Pathologists Say TV Forensics Creates Unrealistic Expectations, AAAS News Release, 21/02/2005 at: http://www.aaas.org/news/releases/2005/0221csi.shtml.

17 Smardz, Z, The Jury's Out: How 12 Reasonable People Got Hung Up on Reasonable Doubt, Washington Post 26/6/2006: http://www.washingtonpost.com/wp-dyn/content/article/2005/06/25/AR2005062500078.html?referrer=emailarticle.

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Yale Law Review, 115:5, 1050-1082.

[19] Blackstone, W, Commentaries on the Laws of England, Book IV, Chapter 27, p352.

[20] University of Leicester, A History of Genetic Fingerprinting at the University of Leicester, Press and Publications Office, 7/11/2004 at: http://www.le.ac.uk/press/geneticshistory.html.

[21] See Cutter AM et al, Balancing Powers: Balancing Powers: Examining models of Biobank Governance 188. JIBL Vol 01 (2004).

[22] Criminal Justice and Public Order Act 1994, s54 – s 59, available at: http://www.opsi.gov.uk/acts/acts1994/Ukpga_19940033_en_5.htm#mdiv54

[23] Specifically The Police and Criminal Evidence Act 1984 s64 and s65 were amended

[24] Under The Police and Criminal Evidence Act 1984 s65(3), as amended by the Criminal Justice & Public Order Act, 'non-intimate sample' means—

(a) a sample of hair other than pubic hair; (b) a sample taken from a nail or from under a nail; (c) a swab taken from any part of a person's body including the mouth but not any other body orifice; (d) saliva; (e) a footprint or a similar impression of any part of a person's body other than a part of his hand;

[25] 'intimate sample' means— (a) a sample of blood, semen or any other tissue fluid, urine or pubic hair; (b) a dental impression; (c) a swab taken from a person's body orifice other than the mouth; .

26 Criminal Evidence Act 1997; Criminal Justice and Police Act 2001; Criminal Justice and Police Act 2003 and the Serious Organised Crime and Police Act 2006.

[27] Office of Science & Technology, The National DNA Database, Postnote 258, February 2006, available at: http://www.forensic.gov.uk/forensic_t/inside/news/docs/postpn258.pdf.

[28] Genewatch UK, The Police National DNA Database, January 2005 available at: http://www.genewatch.org/HumanGen/Publications/Reports/NationalDNADatabase.pdf.

[29] See Sections: 7.0 The future of DNA profiling; 7.1 Predicted changes to DNA profiling; 7.2 Using DNA profiles to predict the characteristics of suspects; 8.0 The future of the NDNAD; 8.1 The changing role of commercial companies; 8.2 Links to other national databases; and 8.3 Using the NDNAD for other purposes.

[30] Onay, O. The true ramifications of genetic criminality research for free will in the criminal justice system. Genomics, Society and Policy Criminal Justice Special Issue. Vol.2,No.1. www.gspjournal.com.

[31] Dr. F. J. Gall quoted in, D. G. Goyder, My Battle for Life: The Autobiography of a Phrenologist. London, 1857, pp. 143-152.

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[35] ACPO, The National DNA Database Annual Report 2004 – 2005 available online at: http://www.acpo.police.uk/asp/policies/Data/NDNAD_AR_04_051.pdf.

[36] Reproduced from data, ACPO, The National DNA Database Annual Report 2004 – 2005, p4 available online at: http://www.acpo.police.uk/asp/policies/Data/NDNAD_AR_04_051.pdf.

[37] ACPO, The National DNA Database Annual Report 2004 – 2005, p4 available online at: http://www.acpo.police.uk/asp/policies/Data/NDNAD_AR_04_051.pdf.

[38] Home Office figures 2005, reproduced from: Office of Science & Technology, The National DNA Database, Postnote 258, February 2006, available at: http://www.forensic.gov.uk/forensic_t/inside/news/docs/postpn258.pdf.

[39] Science & Technology Committee, Seventh Report of Session 2004−05, Forensic Science on Trial, HC 96-I, Recommendation 14.

[40] www.genecodes.com.

[41] See Gerlin, A The Hardest Count: How do you identify the victims of a suicide bomber? Time Magazine, 17/07/05; Bennetto, J Terror in London: Police identifying victims of Asian tsunami switch, The Independent, July 12 2005.

[42] There are a number of pieces of legislation that have supported the establishment of the NDNAD. As

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well as PACE, these are the Criminal Justice and Public Order Act 1994; Criminal Evidence Act 1997; Criminal Justice and Police Act 2001; Criminal Justice and Police Act 2003 and the Serious Organised Crime and Police Act 2006.

[43] Kaye, J. Police Collection and Access to DNA Samples. Genomics, Society and Policy Criminal Justice Special Issue. Vol.2,No.1. www.gspjournal.com.

[44] Section 64(1A) Police & Criminal Evidence Act 1984, as amended by the Criminal Justice and Police Act 2001.

[45] s63(2A) & (2B) of the Police & Criminal Evidence Act 1984, as amended by s10 of The Criminal Justice Act 2003.

[46] National Police Records (Recordable Offences) Regulations 2000 (SI 2000/1139).

[47] Science & Technology Committee, Seventh Report of Session 2004−05, Forensic Science on Trial, HC 96-I, Recommendation 15 – 19 generally.

[48] GeneWatch UK, The Police National DNA Database: Human rights and privacy, Briefing Number 31, June 2005.

[49] Regina v. Chief Constable of South Yorkshire Police ex parte LS; Regina v. Chief Constable of South Yorkshire Police (Respondent) ex parte Marper Consolidated Appeals [2004] UKHL 39 available online at: http://www.publications.parliament.uk/pa/ld200304/ldjudgmt/jd040722/york-1.htm.

[50] Article 8: Right To Respect For Private And Family Life

1. Everyone has the right to respect for his private and family life, his home and his correspondence.

2. There shall be no interference by a public authority with the exercise of this right except such as is in accordance with the law and is necessary in a democratic society in the interests of national security, public safety or the economic well-being of the country, for the prevention of disorder or crime, for the protection of health or morals, or for the protection of the rights and freedoms of others.

[51] Article 14: Prohibition Of Discrimination

'The enjoyment of the rights and freedoms set forth in this Convention shall be secured without discrimination on any ground such as sex, race, colour, language, religion, political or other opinion, national or social origin, association with a national minority, property, birth or other status.'

[52] Regina v. Chief Constable of South Yorkshire Police ex parte LS; Regina v. Chief Constable of South Yorkshire Police (Respondent) ex parte Marper Consolidated Appeals [2004] UKHL 39, paras 1 & 2.

[53] Regina v. Chief Constable of South Yorkshire Police ex parte LS; Regina v. Chief Constable of South Yorkshire Police (Respondent) ex parte Marper Consolidated Appeals [2004] UKHL 39, para 15.

[54] Regina v. Chief Constable of South Yorkshire Police ex parte LS; Regina v. Chief Constable of South Yorkshire Police (Respondent) ex parte Marper Consolidated Appeals [2004] UKHL 39, para 86.

[55] See for example: Genewatch UK, The Police National DNA Database, January 2005 available at: http://www.genewatch.org/HumanGen/Publications/Reports/NationalDNADatabase.pdf.

[56] 'The more complete the database, the better the chance of detecting criminals, both those guilty of crimes past and those whose crimes are yet to be committed. The better chance too of deterring from future crime those whose profiles are already on the database' Lord Brown of Eaton-under-Heywood, Regina v. Chief Constable of South Yorkshire Police ex parte LS; Regina v. Chief Constable of South Yorkshire Police (Respondent) ex parte Marper Consolidated Appeals [2004] UKHL 39, para 88.

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