Accepted for publication in East Asian Science, Technology and Society: An International Journal, to appear in 2014.

TRUMPING COMMUNITARIANISM: CRIME CONTROL AND FORENSIC DNA TYPING AND DATABASING IN SINGAPORE

Victor Toom

victor.toom@northumbria.ac.uk

ABSTRACT

Liberalism and communitarianism have figured prominently in discussions of how to govern forensic DNA typing and databasing (hereafter: forensic DNA practices). Despite the prominence of these two political philosophies and their underlying values, no studies have looked at the governance of forensic DNA practices in a non-democratic country governed by a communitarian logic. To fill this lacuna in the literature, this article will consider Singapore as an authoritarian state governed by a communitarian philosophy. Following the introduction, the article will highlight basic innovations and technologies of forensic DNA practices, and will articulate a liberal democratic version of Lynch and McNally's (2009) "biolegality". It goes on to consider briefly various (political) philosophies (i.e. liberalism and communitarianism) and law enforcement models (i.e. due process and crime control models). The main part of the article records the trajectory, and hence biolegal progress, of forensic DNA practices in Singapore, and compares it with trajectories in England and the USA. The article ends by summarizing some of the main findings.

Keywords: Communitarianism, Liberalism, Crime control model, Law enforcement, Singapore, Governance, forensic DNA typing

1. Introduction[1]

Forensic DNA profiling was developed in the mid-1980s, was soon heralded as the "ultimate identification scheme" by the influential geneticist Eric Lander (1989), and has been subsequently considered as the "gold standard" for identification and individualization by lawyers and others (Scheck et al 2000). Several jurisdictions, predominantly in (but not limited to) liberal democracies, adopted forensic genetic technologies and, in most cases, legislation to govern it aimed to control crime and serve justice in the late 1980s and henceforth (see Hindmarsh and Prainsack 2010; Krimsky and Simoncelli 2011). Legislative measures set provisions for, amongst other things, the conditions for obtaining bodily samples, the governance of DNA databases, and mechanisms for quality control of DNA profiling. Empirical research documented that the lines of development related to setting up DNA databases and the inclusion of suspects and convicts onto those digital repositories are comparable in many jurisdictions and has formed a "common trajectory" (Williams and Johnson 2008: 1). This common trajectory started with DNA typing being predominantly used as *evidence* to secure convictions and to clear the wrongfully accused. Subsequently, and following the establishment of DNA databases as well as development of new profiling technologies, DNA became an increasingly important mechanism providing *intelligence* to state agents involved in criminal investigation. A current development is that jurisdictions seek for mechanisms enabling the *transnational exchange* of DNA data held in national DNA databases. This trajectory of forensic genetics demonstrates a symbiotic relationship between biotech innovations and the law. Lynch and McNally (2009; see also Machado et al 2011; Lawless 2013) coined the concept "biolegality" to document this symbiotic relationship between science and law and to articulate how such technolegal progress redefines and renegotiates the criminal justice system, human rights, suspect bodies and the credibility of various forms of evidence. They contend that biolegal marked bodies are both "object and product of policing and forensic expertise" and have the "potential to expand" (Lynch and McNally 2009: 284). They argue that the notion of biolegality can also provide "broader insight into strains and adjustments that occur when a novel surveillance system is implanted in a *liberal democracy*" (Lynch and McNally 2009: 285, emphasis added). This contribution will provide a provisional account of biolegality in a jurisdiction that is governed according principles different to that of liberal democracy.

Following the introduction of forensic genetics and laws to govern it, scholars from the social sciences, humanities and law have been addressing forensic DNA typing and databasing (hereafter: forensic DNA practices) and have generated a substantial body of literature. This work articulates *inter alia* that forensic DNA practices are subject to technical and legal controversy (Jasanoff 1998; Aronson 2007; Lynch et al 2008), that provisions may comprise violations of constitutional rights (Nuffield Council on Bioethics 2007; ECtHR 2008), that the value and efficacy of DNA databases remains unclear (Human Genetics Commission 2009; McCartney et al 2010), that DNA databases are

[1] A draft of this article was presented at the 'Science, Technology and Society Cluster' colloquium series in October 2011. The colloquium was organized by Dr Axel Gelfert from the National University of Singapore. Comments on earlier drafts were provided by Professor Ho Hock Lai, Dr Maria Corazon de Ungria, and Dr Matthias Wienroth. Professor Robin Williams and Dr Anika Ludwig provided comments and suggestions for further improvements, and corrected the English. I wish to thank all of them. In addition, two anonymous reviewers commented on a previous draft of the present article which led to substantial improvements for which I am very grateful. The research reported in this paper was funded by the Nuffield Foundation (Ref. no. SGS/39176).

a developing instrumentality for increased state surveillance (Williams and Johnson 2004), that minorities populate DNA databases disproportionately (Ossorio and Duster 2005; Skinner 2011), and that criminal investigative epistemologies in the forensic DNA era are subject to constant change (Williams and Johnson 2008). These studies can be said to counter the dominant, contemporary forensic genetic discourse that these technologies are beneficial to society *per se*.

Despite these important studies, a large lacuna is present in the body of literature on forensic DNA practices: whilst all social scientific studies have focussed on liberal democratic jurisdictions (like the United States of America, United Kingdom, Norway or Portugal), social scientific knowledge about forensic genetic practices in other parts of the world (e.g. Saudi Arabia, China or Ukraine) is presently unavailable (see Heinemann et al 2012: 250; Jasanoff 2010).[2] How those countries exactly implement and use forensic DNA practices is unknown. But that it differs becomes clear from a short and contemporary example.

The authoritarian regime of the United Arab Emirates (UAE) announced in October 2009 that it was planning to compile a DNA database with profiles from all its 4.5 million residents (Youssef 2009).[3] As such, the UAE have not followed the common trajectory mentioned above. The aims of the population-wide database are to control crime and to identify victims of a possible future mass fatality. It is currently unclear whether or not legislation was, or has been passed, or, as following remarks of the prospective director of the DNA database in an interview (Youssef 2009), whether setting up such a population-wide DNA database could be decided as "security matter" in which case a security directive would render legislation unnecessary all together. It was estimated that the UAE forensic laboratory would be able to DNA type one million subjects a year, that the project would take a decade, and in January 2011 it was proclaimed that the authorities would commence gathering samples in 2012 (Dajani 2011). As the government of UAE does not adhere to principles like transparency and accountability of governance, more information about UAE's efforts to build a population-wide DNA database is currently unavailable.

Were these mechanisms in place, it would become possible to document whether: the UAE authorities will ask its citizenry to volunteer biological samples, or whether such sampling would be enforced using the strong arm of the law; whether the population-wide database applies to the elite as well, or to the less privileged, migrants and tourists only; in what class of punishable crimes police will start collecting crime scene samples; and what rights subjects will have if a match is found between his/her profile and a trace collected at a crime scene? All these tentative yet (presently) unanswerable questions are important as forensic DNA practices pose challenges for civil liberties and may disproportionally harm vulnerable populations (Cole 2007; Nuffield Council on Bioethics

[2] An extensive search on the internet as well as various scholarly databases identified only two contributions on forensic genetics' issues and practices in countries not located in the global north (including Australia and New Zealand). De Ungria and Jose (2010) document the Philippines' experience regarding emerging forensic DNA practices, and Parven (2012) examines *inter alia* the forensic use of DNA information in a developing country, i.e. Bangladesh.

[3] Following UAE in its decision, Pakistan, Uzbekistan and Bermuda are said to also have proposed including their entire population in a national DNA database, see http://www.soros.org/voices/forensic-genetics-a-global-human-rights-challenge (accessed 1 October 2012). Even the British ex-prime minister Tony Blair called for including every citizen in a forensic DNA database in 2006, see http://www.telegraph.co.uk/news/uknews/1532210/DNA-database-should-include-all.html# (accessed 17 June 2013).

2007). Also, they may provide state agencies with novel and powerful mechanisms for increased surveillance and as such may further the asymmetrical power relations between subjects living in the UAE and its state agencies and its governing elite.

This article is a first attempt to fill the abovementioned lacuna. It will do so by documenting the trajectory of Singaporean forensic DNA practices, and to compare this trajectory with the development of forensic DNA practices in England & Wales and the United States of America (hereafter: England and USA respectively). Comparing the trajectories of relevant biolegal progress in Singapore, England and the USA also takes account of their locations within two different political systems. England and the USA are considered full-fledged democracies yet Singapore is not. Where England and the USA respect human rights, Singapore is reported to violate basic civil rights.[4] The question this article addresses is whether it is possible to discern a version of biolegal progress in Singapore which differs from liberal democratic biolegality? To answer this question, the article first considers the use of forensic DNA typing technologies in liberal democracies before discussing two sets of principles contributing to forensic DNA governance and practice. Details of Singapore and its forensic DNA practices are presented in the main section of the present article. This contribution ends with summarizing the main results and some reflections on them.

2. Forensic DNA typing technologies in liberal democracies

In the mid-1980s, Sir Alec J. Jeffreys and his co-workers invented a method for individualizing human biological material which they described as "DNA fingerprinting" (Jeffreys et al 1985). DNA fingerprint techniques were notorious for several analytical problems and interpretive complexities (Lander 1989), but many of these drawbacks were technically resolved in the mid-1990s when tandemly reiterated DNA sequences or Short Tandem Repeats (STRs) replaced the previously used DNA fingerprinting techniques. STR profiles had several advantages over DNA fingerprints. One of the most important traits being that STRs could be determined exactly and numerically. Consequently, STRs could be stored digitally and therefore set a condition of possibility for digitally uploading these profiles in forensic DNA databases. Because of the capacity of DNA databases to match DNA profiles obtained from crime scene traces (DNA traces) to DNA profiles from known individuals (DNA subject profiles), forensic genetics has not only been utilized as *evidence* in courts, but also provides the police with *intelligence* as subject profiles may match DNA traces originating unsolved crimes.

As soon as STRs were considered as viable forensic markers, geneticists of the European DNA Profiling Group coordinated efforts to standardize (and validate) STRs throughout European nations. Their labour crystallized out in several recommendations to include specific STRs in DNA typing kits (e.g. Gill et al 2000). Recommendations were followed up by a multitude of stakeholders. First, biotech companies (e.g. *Promega*, *Applied Biosystems*) developed so-called 'multiplex DNA typing systems' incorporating validated STRs (and PCR, see below). Second, the Council of the European Union issued resolutions endorsing to further standardize STRs throughout the European Union

[4] The statement of course is not entirely true since the USA detains (alleged) combatants of al Qaeda and Taliban in the Guantanamo Bay detention camp. Also, several states in the USA execute convicted offenders.

consequently enacting the European Standard Set (ESS) (EU Council 2009).[5] And third, the USA Federal Bureau of Investigation (FBI) developed DNA database management software which includes the ESS; the FBI has also made the software freely available to other law enforcement authorities in the USA and beyond.[6] It can therefore be concluded that forensic geneticists, policy makers, biotech companies and law enforcement officials made a concerted effort to standardize STRs globally (Prainsack and Toom 2013: 75).

The invention of a technology to replicate biological material *in vitro* – usually called Polymerase Chain Reaction (PCR, see Mullis 1990; Rabinow 1996) – rendered it possible to do forensic DNA analysis on biological material other than blood and semen as was previously the case. This contributed to two new possibilities. First, DNA profiles could be provided from biological traces like saliva present on cigarette butts and soda cans or skin cells from clothes. Such items are often collected at scenes of less severe crimes (e.g. burglary, car theft) and hence the availability of PCR importantly added to forensic genetics' capacity to be applied in the investigation of less severe criminal activities. Secondly, and connected to the first, blood of subjects was no longer required as equally reliable DNA profiles could now be determined from saliva. Taking a sample of saliva is, by many policy makers and other stakeholders, considered a less severe violation of one's body and bodily integrity when compared to the mandatory taking of a blood sample. The availability of PCR hence importantly limited some of the ethical and legal concerns which surrounded the taking of subject samples.

Forensic DNA practices as discussed so far aim to match traces collected at crime scenes to reference samples obtained from subjects; they are technologies for *identification through individualization*. In recent years, new genetic insights, the availability of large population genetic databases as well as technological innovations crystallized out in the application of DNA technologies aimed at *clustering potential suspects* (Cole and Lynch 2006; M'charek 2008; Toom 2012a). One application regards searching for possible familial relations between the unknown originator of a DNA trace and known subjects in the database (hereafter: familial searching).[7] Familial searching is based on the fact that DNA profiles of biological families are statistically expected to be more similar than DNA profiles originating from two unrelated individuals. This knowledge can be used in criminal investigations where a DNA trace is uploaded to the database but does not match any other subject profile. A custodian may subsequently, and according legislative or regulatory provisions, search for similar yet not identical DNA profiles (hereafter: near matches) (*c.f.* Bieber et al 2006: 1315). If a near match between a crime scene sample and a subject profile already included in a database is identified, it *may* be possible that a sibling, parent or child of the known subject is the originator of the crime scene sample; it renders that specific family suspect. Yet since familial searching is based on statistics and shared genetic markers, there is also a significant chance that all members of the identified potentially suspect family are innocent and hence have nothing to do with the crime under investigation (Curran and Buckleton 2008).

[5] The International Criminal Police Organization (INTERPOL) applies the same set of STRs as ESS in their 'Interpol Standard Set of Loci' (ISSOL).
[6] See http://www.fbi.gov/about-us/lab/codis (accessed 26 September 2012).
[7] Another set of technologies infers external visible characteristics (e.g. sex, age) or biographic ancestry (e.g. European, North African). These technologies are not discussed in this contribution as they are currently hardly utilized in law enforcement practices. For an introduction of such technologies, see Kayser and Schneider (2009); and for discussion, see M'charek et al (2012) and Toom (2012a).

This section succinctly documented how forensic DNA practices were first aimed at evidence and later also at producing intelligence; that these technologies were first used in severe and violent crimes, and later also in volume crimes; and that DNA typing technologies are not only aimed at individualizing subjects, but also at clustering potential suspects and suspect families. An additional development is that national forensic DNA practices are now also rendered in international practices given current transnational exchange programs (Bellanova 2008; McCartney et al 2011; Prainsack and Toom 2010, 2013). These four advances have all been documented in the development of forensic genetics in liberal democracies. Liberal democracy refers here to several issues. First, it is in this article considered a location, namely countries situated in (what is often called) the 'global north'. Second, liberal democracy refers to a political system to order a state adhering to standards like democratic institutions, rule of law, effective participation of the public, logic of equality, enlightened understanding of policy and its alternatives, and control over the political agenda (see Dahl 1998). Third, liberal democracy is in this article considered a political philosophy (i.e. liberalism) aimed at protecting individuals from too much interference by state agents through providing the former with individual rights which cannot be breached by the latter without democratically agreed upon rules. Consequently, forensic DNA typing technologies provided the conditions of possibility for these applications. In many jurisdictions it would however be legally impossible to apply these technologies in law enforcement practices since the use of such technologies is limited by *inter alia* individual rights, legal principles, particular understands of ethical conduct, and fiscal resources. To overcome such constraints, many national parliaments enacted forensic DNA typing laws and policies for the use of these technologies. Indeed, the resulting practices are liberal democratic articulations of biolegal progress. It is however interesting to note that the literature on the governance of forensic DNA practices often refers not only to liberalism, but also to communitarianism (Nuffield Council on Bioethics 2007; Human Genetics Commission 2009).[8]

3. Sets of principles guiding governance and practice of forensic genetics

Scholarly debates regarding the governance of forensic DNA practices commonly focus on one of two sets of principles. The first set of principles stems from a cautious attitude towards the state, its monopoly on the use of violence and institutions liable to utilize those powers (Fitzgerald and Ellsworth 1984: 33) which "results in the perceived need for institutionalized checks and balances" (Ho 2010: 244). To protect subjects against these powers, individual rights like liberty, autonomy and privacy are emphasized. Consequently this model will advocate a strong orientation towards so-called 'due process' criminal justice practices in order to prevent innocent individuals being unfairly treated. The model leans heavily on the requirement for the state to prove guilt beyond reasonable doubt and emphasizes the presumption of innocence principle (Beyleveld 1997: 9; Ho 2010). The second set of principles assumes that the state and its institutions can be trusted to a great extent and hence it has a predisposition to assume that a strong state is the best guarantee for the 'common good', sometimes defined as the greatest benefit for the greatest number. This second set of principles will be more inclined towards a 'crime control' model as a mechanism to deter or repress crime and to swiftly and efficiently administer justice to offenders (Fitzgerald and Ellsworth

[8] 'Utilitarianism' is also often mentioned as guiding principle to model forensic DNA practices, see Nuffield Council on Bioethics 2007; Human Genetics Commission 2009.

1984: 33-34; Beyleveld 1997: 8-9; Van Houdt and Schinkel 2013:14). Whereas the first set of principles favours individual rights, the second set stresses the collective good. The former is often associated with liberalism and the latter with (forms of) communitarianism (Beyleveld 1997; Etzioni 2004, 2006; Van Houdt and Schinkel 2013).

Since liberalism and due process on the one hand and communitarianism and crime control model on the other hand are two ideal types, there is always interplay of the positions in practice – they are simultaneously present (Van Houdt and Schinkel 2013). Yet accentuating either the liberalist-due-process or the communitarian-crime-control-model set of principles will make a difference. For instance, sociologist and influential advocate of communitarianism Amitai Etzioni (2004: 201) rather naively remarked (or at least from an STS perspective) that "DNA usages will lead not only to more convictions, but also to fewer crimes being committed in the first place, which is the best of all worlds. In short, the benefits to public safety of DNA usages are very substantial." In short, public safety, or so Etzioni argues, is regarded more important than protection of individual rights. From such position it is only a small step to argue for a population-wide DNA database to control crime (and additionally identify victims of disaster), as the example of the UAE population-wide DNA database demonstrates. Etzioni's claim and the UAE project both show that the common good defined as controlling crime (potentially) trumps the individual, their rights and due process. In other jurisdictions, where individuals and due process are weighted more heavily than plain 'safety' or the 'war against crime', forensic DNA practices may be rolled out more prudently such as in the USA or the Netherlands (Aronson 2010; Toom 2012b).

4. Forensic DNA practices in Singapore

The present contribution is the first (STS) article which addresses the history, legislation, trajectory, and utility of forensic DNA practices in a country not organized according liberal democratic ideals. More specifically, it will consider Singapore as an authoritarian state advocating communitarianism and pursuing the crime control model. The city state also makes an interesting case study to document biolegal progress as it has been the first jurisdiction implementing forensic DNA practices in the Southeast Asian region and hence provides a potential model for rolling out forensic DNA practices in other countries in that region. A third reason for studying Singapore is that its government is English speaking which renders all kinds of written documents accessible for research. In addition, government officials can be interviewed in English. Or at least, in 'theory'; the 'practice' of considering Singapore as a case study proved to be extremely unruly which posed methodological challenges.

A two-month research trip to Singapore (September and October 2011) was planned to collect relevant documents as well as to interview ten to fifteen officials of the Health Science Authorities, Ministry of Home Affairs, Ministry of Law, the Attorney-General's Chambers, the Law Society, Supreme Court, Police Force and human rights organisations. I anticipated that interviews with officials would include (general) questions about legislation, operational activities including the national DNA database, the prospect of international cooperation, and ethical issues. The aim of these interviews would be to articulate how Singapore's communitarian approach to governance and politics give shape and content to Singapore's forensic DNA practices; furthermore, I considered these 'moments of contact' as opportunities to gather additional policy documents. In other words,

would it be possible to discern a communitarian version of Lynch and McNally's (2009) liberal democratic concept "biolegality"? Yet what I severely underestimated was that officials in some jurisdictions do not adhere to governing principles like transparency and accountability. Or, as recently stated by criminologists Lee and Laidler (2013: 148), some Asian countries may be "reluctant to open the doors to researchers for cultural, political and economic reasons ... particularly [for] those with a critical perspective." Such is also the case for Singapore, or, as I experienced, at least where it concerns questions about its law enforcement practices and human rights issues. In total, more than forty emails were sent to over twenty different officials which were followed by many more telephone calls. All officials asked for more information, but no one subsequently consented to being interviewed. As such, this article is based on publicly available resources including transcripts from Parliamentarian debates, legal provisions published in the *Government Gazette*, news items from the national news paper *Straits Times*, verdicts and jurisprudence, and official publications from Singapore's government agencies. Consequently, this article documents the lines of development of Singapore's forensic DNA practices, provisionally articulates how communitarianism shapes policy and governance of Singapore's forensic DNA practices, and also considers how communitarian versions of biolegality became, in the case of Singapore, enacted through "technical developments, government legislation, policing practices and appeal court rulings" (Lynch and McNally 2009: 285).

4.1 An authoritarian communitarian state

Singapore, a city-state just north of the equator in the Southeast Asian region, is populated by approximately 5 million people. It is regarded a very prosperous state and safe country, scoring high in all lists that record the gross domestic product per capita and crime rates.[9] On the other hand, the city-state performs poorly in several democratic and human rights lists. It is qualified as a "partly free" democracy and "authoritarian state" by the Freedom House Organisation and Human Rights Watch respectively. The USA Department of State reported that "preventive detention, infringement of citizens' privacy rights, restriction of speech and press freedom and the practice of self-censorship by journalists, restriction of freedoms of assembly and association, limited restriction of freedom of religion, and some trafficking in persons" are still urgent issues that need to be resolved.[10] In addition, Amnesty International regularly reports that Singapore's legal system still ill-treats prisoners, and that it tortures and executes convicted offenders.[11] So according to human right and democratic indexes, Singapore does not qualify as a (liberal) democracy. This observation corresponds with conclusions by political scientists who classify Singapore as an "illiberal

[9] See for an overview: http://en.wikipedia.org/wiki/List_of_countries_by_GDP_%28nominal%29_per_capita (accessed 6 October 2012). Singapore had between a 0.3 and 0.6 homicide per 100,000 capita in the past decade according data of the United Nations Office on Drugs and Crime, other statistical data ranks Singapore as 3rd on the Numbeo.com 'safety index', and 6th on the prosperity.com 'safety and security index', see respectively: http://www.unodc.org/unodc/en/data-and-analysis/homicide.html; http://www.numbeo.com/quality-of-life/rankings_by_country.jsp; http://www.prosperity.com (accessed 3 October 2012).

[10] See http://www.freedomhouse.org, http://www.hrw.org/asia/singapore, and http://www.state.gov/j/drl/rls/hrrpt/2009/eap/136008.htm (accessed 9 October 2012).

[11] http://www.amnesty.org/en/region/singapore/report-2011 (accessed 9 October 2012).

democracy" (Ortmann 2011: 153) and as a facade democracy in order to conceal "authoritarian governance" (Schedler 2009: 381).

Asian values have been promoted as governing principles by Singapore's governing elite. The former president Lee Kuan Yew argued in an interview that Eastern societies "believe that the individual exists in the context of his family. He is not pristine and separate. The family is part of the extended family, and then friends and the wider society" (quoted in Zakaria 1994: 113). As such, the individual is always implicated in the wider social network, in the community. Asian values foster a communitarian approach to policy and governance (*c.f.* O'Dwyer 2003: 42). This article will hence consider Singapore – as Singapore curtails individual rights and political liberties to maintain social order – as an "authoritarian communitarian" state (see Etzioni 2011: 17). This claim is further substantiated as official publications of Singapore's government, statements of its elite and analyses of various scholars all indicate that Singapore applies communitarian principles to governance (see Zakaria 1994; Tan 2000: 102; Chua and Shing 2003: 211; Lee 2008: 356, 373).

Apart from the political system being based on authoritarian forms of communitarianism, the underlying values of Singapore's criminal justice system mirror, according a retired Attorney-General of Singapore and former Chief Justice of Singapore, the "crime control model" (Keong 2000: 28). The judiciary has been classified as "coldly efficient" (Siyuan and Chua 2010: 99), severely affecting the balance between due process and the crime control model, which "is struck by heavily weighting the crime control side of the scales with broadly defined criminal laws, which utilise presumptions against the accused and contain harsh punishments" (Siyuan and Chua 2010: 100). The lack of sufficient due process mechanisms has even been documented in capital cases (Hor 2004).[12] The government has allegedly been willing to exchange "respect for 'human rights' for better crime control, to barter expensive, time consuming trial processes for the efficiency of administrative decisions" (Hor 2001: 28). In other words, the crime control model seems to be weighted heavier than due process mechanisms. As we will see below, Singapore's authoritarian communitarian approach to policy and governance and its disposition to foregrounding the crime control model are conducive to a very restrictive forensic DNA practice.

4.2 Introducing Singapore's forensic DNA practices

Singapore has been a regional forerunner in implementing and using forensic DNA typing. It set up a forensic DNA laboratory in 1990, and DNA evidence was accepted in Singaporean courts in 1991. DNA experts from Singapore's Health Sciences Authority (HSA) assisted in efforts to identify the victims following the 2004 Asian tsunami and the 2011 earthquake in Christchurch, New Zealand. Other officials have been involved in training forensic DNA analysts (and other practitioners) from the Southeast Asian region. It was also the first Southeast Asian country with specific forensic DNA legislation – the Registration of Criminals (Amendment) Act 2003 – and a national DNA database.

The HSA Biology Division runs two laboratories: the DNA Profiling Laboratory, and the DNA Database Laboratory. Both laboratories meet all contemporary international standards and obtained

[12] Another example that demonstrates that Singapore's judiciary is not impartial regards the conviction of research journalist Alan Shadrake in 2010 which verdict was confirmed by the Court of Appeal in 2011, see http://www.guardian.co.uk/world/2011/jul/27/jail-singapore (accessed 5 November 2012).

accreditation from the American Society of Crime Laboratory Directors/Laboratory Accreditation Board (ASCLD/LAB) in 1996.[13] Accreditation is aimed at demonstrating that a specific laboratory meets standards according to the ISO 17025 which apply to management, personnel, quality system, operational and technical procedures, equipment and physical facilities.[14] So 'trust' – an essential element of communitarian governance (Beyleveld 1997; Etzioni 2004, 2006) – is partly distributed to procedural mechanisms. Accreditation does however not rule out that mistakes are being made as illustrated by a HSA announcement in January 2012: "The Health Sciences Authority (HSA) has initiated the re-test of the DNA samples of 87 criminal cases as a precautionary measure ... This re-testing was initiated following HSA's discovery that a reagent of higher than usual concentration ("the Reagent") was prepared and used as part of the DNA testing process in its DNA Profiling Laboratory (DNAPL) from October 2010 to August 2011" (HSA 2012; see also AGC 2012). Following the announcement, Singapore's Health minister Gan Kim Yong apologized for what was coined a "blunder" (Yuen 2012). Such may be regarded a motion of no confidence and hence detrimental for the public trust of Singapore's citizenry in Singapore's government in general and the HSA in particular.

A senior science writer of the national newspaper *Straits Times* observed that "[m]ost locals have great faith in the criminal justice system of Singapore" yet this error also proved that Singapore's agents occasionally do make mistakes and hence the possibility of a miscarriage of justice "seems to have surfaced" (Ho 2012).[15] Based on this conclusion, the science writer made a plea for implementing post-conviction DNA testing in Singapore. Another *Straits Times* writer praised the laboratory manager responsible for the error for reporting it to the management; this second writer also appreciated the HSA's response for calling "all relevant government agencies to review the import of the mistake and take steps to rectify the wrong. This kind of personal and institutional integrity to admit wrongdoing and take steps to fix a wrong goes a long way to help the public maintain confidence in the HSA" (Khalik 2012). Contributors to online forums stressed that they also valued the response of the HSA and emphasized that HSA's admittance of the error would contribute to "inculcate a culture of not afraid of being transparent".[16] So apart from an appreciation of the HSA being transparent, the quoted (and many other) responses also articulated a general lack of transparency of Singapore's institutions in general and law enforcement authorities in particular.

4.3 Singapore's trajectory: forensic DNA legislation and expansion of the database

Although Singapore set up a forensic DNA laboratory in 1990, a legal framework for the routine application of DNA profiling was lacking until 2002 when the Singaporean government presented the

[13] http://www.hsa.gov.sg/publish/hsaportal/en/applied_sciences/Bio_Services.html (accessed 28 September 2012).

[14] 'ISO' stands for International Organization for Standardization, the organization was founded in 1947. For the body that accredited the HSA laboratory, see http://www.ascld-lab.org/ (accessed 3 October 2012).

[15] Less than a year later, in March 2013, Singapore's Court of Appeal quashed the conviction of a death row inmate based on a doubtful testimony of a police officer as well as the absence of DNA on any of the exhibits, see: http://wrongfulconvictionsblog.org/category/dna/ and http://news.asiaone.com/News/AsiaOne%2BNews/Crime/Story/A1Story20130310-407514.html (accessed 17 June 2013).

[16] See http://forums.vr-zone.com/chit-chatting/1902409-health-minister-gan-kim-yong-apologises-hsas-dna-lab-error.html (accessed 3 October 2012).

"Registration of Criminals (Amendment) Bill". This Bill provided legal provisions for (among other things) the taking of bodily samples, the setting up a national DNA database, and the removal of DNA profiles from the database. The Bill was read in October and December 2002 in Parliament and subsequently the "Registration of Criminals (Amendment) Act" was published in the Singapore *Government Gazette* in December 2002. The Act commenced on February 13th, 2003 and stipulates the (mandatory) taking of body samples (blood, hair, saliva) of any individual who is "(*a*) arrested and accused of a crime; (*b*) is convicted of a crime; or (*c*) is serving his term of imprisonment in connection with a crime of which he has been convicted" (Republic of Singapore 2002). In addition, bodily samples for DNA profiling can also be obtained from individuals who are arrested and detained without a trial according the widely criticized "Criminal Law (Temporary Provisions) Act".[17] Apart from (mandatory) bodily sample collection, the Registration of Criminals (Amendment) Act sets provisions for individuals volunteering a sample when they were present at the scene of a crime (e.g. for elimination purposes) or when he or she is being questioned in connection with a crime (e.g. in a so-called 'DNA mass screening' where law enforcement authorities request people to volunteer a DNA sample in attempts to find a culprit).

Singapore's forensic national DNA database is owned by the Singapore Police Force; the HSA is in charge of its daily management. All DNA profiles obtained are uploaded onto the database. DNA profiles from acquitted or discharged suspects should be removed; originators of subject profiles who die or who reach the age of 100 should also be removed. Although the deletion of DNA profiles from the database from those arrested and accused of a crime but never convicted is required by the Registration of Criminals (Amendment) Act 2003, there are no provisions for destroying biological samples of innocent individuals. It is therefore assumed that a large collection of bodily samples of those considered innocent are retained indefinitely by the HSA. The decision of the European Court of Human Rights in the case of *S. and Marper v. the United Kingdom* (ECtHR 2008) ruled it disproportionate and unnecessary in a democracy to indefinitely retain DNA profiles and biological samples (as well as fingerprints) of those individuals who were once arrested but never convicted of a crime. In other words, the indefinite retention of forensic bodily samples in Singapore from those considered innocent is regarded a disproportionate measure from a liberalist and human rights perspective.

Having set the legal landscape, the next question to be answered regards the expansion of Singapore's DNA database. Unfortunately, the registrar of the database does not regularly provide public available data about size and structure of the database.[18] Upon commencement of the Registration of Criminals (Amendment) Act in February 2003, the HSA received 14,000 blood samples from all prisoners, these samples were subsequently DNA typed and uploaded to the DNA database (Tan-Siew et al 2007). This number further increased to 37,000 in September 2004, 53,000 in December 2007, 100,000 in October 2009 and 180,000 samples in January 2012 (see Parliamentary Debates 2004; Dee 2007; Quek 2009; Ho 2012). Based on these figures, and taking into account that the total population of Singapore amounted to 5,312,400 in 2012, 3.89% of those

[17] The Criminal Law (Temporary Provisions) Act has been termed the "crime control model *par excellence*" (Hor 2001: 29; see also Ho 2010)

[18] See Hor (2001: 38, 39) for another example of Singapore's government being deficient in providing information about the criminal justice system, in particular information regarding capital and corporeal punishment.

subjects liable for DNA typing were included to the national forensic DNA database in early 2012.[19] In figure 1, available data with regard to Singapore's DNA database is summarized, also added are basic statistics of the National DNA Database of England and Wales (NDNAD) and the USA national DNA database, the Combined DNA Index (CODIS).[20]

Figure 1: Basic statistics of Singapore's national DNA database, NDNAD and CODIS

	Singapore	**England/NDNAD**	**USA/CODIS**
Total population	5,312,400	53,700,000	314,455,000
DNA database launch	2003	1995	1998[21]
Total of persons in the DNA database	180,000	5,570,284	11,091,500
Proportion of population in database	3.89%	10.4%	3.5%
Total of traces	Unknown	386,841	447,300
Total of DNA profiles in database	Unknown	5,756,513	11,538,800
Total of stain-person matches	Unknown	409,715	187,700
Stain-person matches per person[22]	Unknown	0.074	0.017
Proportion of traces of total amount	Unknown	6.72%	3.88%

Based on these figures, some provisional inferences can be drawn regarding the uploading of subject profiles in Singapore. First, the size of Singapore's database relative to its population *currently* is smaller than the NDNAD and similar to CODIS. Second, since Singapore's database went live in 2003 and the NDNAD and CODIS in 1995 and 1998 respectively, the former expanded much faster than CODIS yet slower than the NDNAD.[23] Concerns over "liberty and privacy" in the USA have importantly contributed to the relative slow expansion of CODIS (Aronson 2010: 257) and hence may be considered an articulation of a liberal democratic biolegality.[24] In contrast, the regimes for inclusion in England have been termed the "end of innocence" (Williams and Johnson 2008: 87) which provide a rational for the substantial relative size of the NDNAD. *The end of innocence*-claim was acknowledged in the abovementioned *S. and Marper v. the United Kingdom* judgement of the European Court of Human Rights (ECtHR 2008). It rendered the English practice of indefinitely retaining DNA profiles and bodily samples (as well as fingerprints) of those considered legally innocent unlawful. The coalition government subsequently drafted the Protection of Freedoms Bill which came in force in 2012 (McCartney 2012; Toom 2012b), thereby reinstalling measures aimed at

[19] http://www.singstat.gov.sg/stats/themes/people/hist/popn.html (accessed 28 September 2012).
[20] http://www.npia.police.uk/en/13338.htm; http://www.fbi.gov/about-us/lab/codis/ndis-statistics (accessed 10 October 2012).
[21] CODIS is both a standardized software tool and a mechanism that connects all State DNA databases in national network. Although CODIS went live in 1998 there is a lot of variation in establishing State DNA databases throughout the US, see Krimsky and Simoncelli (2011).
[22] These proportions are calculated by dividing 'total of stain-person matches' with 'total of persons in the database': England & Wales $\frac{409715}{5570284}$; US: $\frac{187700}{11091500}$.
[23] These inferences are based on a simple estimation of the proportion of the population added per year on average since the launch of each national database: Singapore: 0.432 per annum (3.89/9y); England: 0.588 per annum (10/17y); US: 0.25 per annum (3.5/14y).
[24] CODIS is likely to expand faster since the recent *Maryland v. King* judgement of the Supreme Court of the United States. It was decided that obtaining arrestee's DNA is a legitimate procedure under the Fourth Amendment: "When officers make an arrest supported by probable cause to hold a suspect for a serious offense and bring him to the station to be detained in custody, taking and analyzing a cheek swab of the arrestee's DNA is, like fingerprinting and photographing, a legitimate police booking procedure that is reasonable under the Fourth Amendment" (Supreme Court of the United States 2013).

protecting individuals and hence shifting towards a liberal democratic and due process approach. Consequently, data of more than 1 million innocent persons must be removed.[25] Once these profiles are cleared from the NDNAD it will still hold the largest proportion of a national population in a liberal democracy. Although liberal democratic biolegality is conducive to a proportional forensic DNA practice, the pre-Marper situation demonstrates that it is a thin line between proportionate and disproportionate interferences with subjects' rights.

It is hard to predict exactly how large Singapore's database will become due to the lack of available information. This is a problematic issue when considered from a communitarian perspective. For instance, Etzioni (2006: 215) argues that "the *good communitarian* society has two key elements: a carefully crafted balance between liberty and the common good as well as between individual rights and social responsibilities, and a social order based as much as possible on moral persuasion as opposed to coercion" (emphasis added). He continues to argue that especially the second element – the need for moral persuasion concerning policy measures – is quintessential for what he terms the *good* communitarian society. More specifically, he contends that the basis for "legal, policy and ethical deliberations ... needs to be and can be found most effectively through dialogue" (Etzioni 2006: 215). Dialogue is only possible if sufficient information on a policy issue is publicly available. Since the Singaporean authorities do not provide such information routinely, and since they do not consent to being interviewed on governance and practice of forensic genetics, it is impossible for the government to morally persuade the citizenry about the best way to roll out forensic DNA practices; it is a biolegality defined by the absence of moral persuasion. The performance of DNA databases is a recurrent topic that has spurred much debate (e.g. Human Genetics Commission 2009; McCartney et al 2010). Challenges that hinder assessments of DNA databases on its own or in combination with other databases include *inter alia* various national legal frameworks, different regimes for removing subject and trace profiles, various definitions of 'hits' and 'matches' and how they are counted, how 'matches' are followed up, how many 'matches' result in a verdict, or whether the crime would have been detected without DNA (see further ENFSI 2012). However, and despite these and other challenges, measurements are possible. One performance indicator, as advocated by the influential European Network of Forensic Science Institutes (ENFSI), is the so-called "stain-person matches per person" ('total of stain-person matches' divided by 'total of persons', see ENFSI 2012). This measure requires information about the total number of DNA subject profiles and DNA traces in a database and the amount of matches generated by comparing them. Unfortunately the HSA does not make such data publicly accessible and hence it is impossible to compare the performance of Singapore's DNA database with that of the NDNAD or CODIS (0.074 and 0.017 respectively, see figure 1). Hence Singapore's governance of the database is also deficient in Etzioni's first key element: the balance between liberty and the common good. This balance can only be evaluated if performance outcomes of the DNA database are available. In one occasion the HSA reported that DNA matches had contributed to solving 350 crimes since the database launch in 2003 (Quek 2009). Solving 350 crimes through a DNA match is not an insignificant result yet when compared with the NDNAD and CODIS stain-person-matches – 409,715 and 187,700 respectively – it is an outright poor outcome. One can only hypothesize about the reason for the produced matches lagging behind in the specified period. The most likely explanation is that Singapore's national DNA database lacks a balanced ratio between subject profiles and DNA traces. This hypothesis is backed-up by a comparative and partly quantitative study which suggests it is likely "that a more effective means of increasing hit rates is to

[25] http://www.genewatch.org/sub-570225 (accessed 6 November 2012).

increase the number of crime-scene profiles uploaded into the database rather than continue to add more suspects and arrestees (and convicts to lesser crimes) to the database net. The latter does improve the hit rate somewhat, but the former improves it much more" (Goulka et al 2010: 20; see also Nuffield Council on Bioethics 2007: xvi). Put differently, if authorities want to increase hit rates they need not only upload subject samples, but also invest in collecting DNA traces at crime scenes.

If this hypothesis is true, three possible explanations may provide insight into the imbalance of the ratio subject profiles and DNA traces. First, since crime rates are low in Singapore it may result in only very few DNA traces collected at crime scenes. Second, most criminal cases are being solved and hence the database has a very small proportion of DNA traces (as DNA traces of solved crimes are typically removed from the database after a case is closed). Third, law enforcement authorities embrace a forensic DNA practice focused at including a substantial part of the population in the national DNA database instead of collecting DNA traces at crime scenes aimed at achieving a balanced ratio between subject profiles and DNA traces. Whereas the first hypothesis would challenge a further expansion of the DNA database since there are not so many crimes being committed, the two subsequent explanations would fit Singapore's law enforcement authorities embracing forensic DNA practice to subject a large proportion of its citizenry to genetic surveillance as a mechanism to control crime.

4.4 Near matches and familial searching

The abovementioned trajectory of forensic DNA practices refers not only to inclusion regimes to the database, but also to forensic DNA technologies' applications. As documented in section 2, new interpretive schemas for DNA typing are available. One such application, searching for near matches as a proxy for a biological relation between a DNA trace and a subject profile (i.e. familial searching), has been utilized in criminal enquiries in Singapore and will be discussed here.

The Registration of Criminals (Amendment) Act 2003 does not forbid searching for near matches or utilizing familial searching yet the extent to which Singapore's law enforcement authorities use this mechanism is currently unknown. But that searching for near matches and familial searching has occurred becomes clear from two empirical sources. The first concerns a judgement of the Court of Appeal (2011) which reports about an old lady who was found murdered in her flat in 2005. A man was arrested and soon confessed responsibility. If murder is proven in Singapore, the mandatory punishment is the death penalty. DNA typing proved to be enormously potent in this case for two reasons. One, the DNA profile of the suspect did not match traces recovered from the victim and hence DNA typing contributed to clearing his involvement in this capital crime. Two, although the suspect's DNA profile did not match the DNA trace it revealed some remarkable similarities. Similar yet not identical DNA profiles may indicate a biological relationship between the originator of the trace and the subject whose DNA profile is compared with the trace. A HSA DNA analyst subsequently notified the police about the near match, and informed them that a sibling of the suspect possibly was the originator of the crime scene trace (Court of Appeal 2011). Based on these findings, the brother of the first suspect was arrested and convicted for the homicide. Since the court did not question the HSA analyst's conduct of informing the police about the near match, it should hence be concluded that this form of familial searching is legally allowed in Singapore. Apart from coincidental near matches, the HSA has been utilizing algorithms to search the database for

potential biological relatives as was reported in a recent HSA annual report: "The DNA Database Laboratory scored a first in the use of a new genetic algorithm, familial searching, in the tracing of a murder suspect through his relatives in the criminal database" (HSA 2011: 60). Any further information about the specifics of this investigation and court proceedings are currently unavailable. While further information regarding familial searching or reporting near matches is publicly unavailable, policy arrangements in England and the USA will shortly be considered to shed light on the various familial searching policy arrangements.

Familial searching policies or regulations are quintessential as the "nature of familial searching means that most if not all of the families nominated by the list will have no involvement in the crime in question" (Curran and Buckleton 2008: 164; see also Haimes 2006; Williams and Johnson 2006; Murphy 2010). It is for several technical and social, ethical, legal and fiscal reasons that the English police, the NDNAD strategy board and forensic science providers have been developing regulations and protocols to mitigate potential societal threats, as well as carefully manage familial searching in criminal enquiries (Home Office 2006). The USA has a comparable mode of regulating familial searching. Currently, familial searching is only allowed in California, Colorado, Texas and Virginia. These States apply protocols for familial searching in their individual State DNA databases in unsolved cases if all leads are exhausted.[26] A pending Bill called "Utilizing DNA Technology to Solve Cold Cases Act of 2011" will, if it gets accepted by the Senate and House of Representatives of the USA, allow the Federal Bureau of Investigation to conduct "familial searches for DNA samples collected from crime scenes in State investigations" when no identical DNA matches were obtained in (attempts) of murder, manslaughter, and sexual abuse (USA Congress 2011). Were the Bill enacted, it thus allows for conducting familial searches utilizing CODIS instead of the individual State DNA databases. A significant advantage of a full-fledged legislation for governing familial searching – which was commenced in the Netherlands in April 2012 (Toom 2012b) and possibly becomes enacted in the USA – is that it renders these practices more transparent and thus contributes to making accountable law enforcement agencies and agents as well as policy makers.[27] The absence of adherence to any of these principles, as well as the unavailability of any further information or rules for this application significantly limits legitimacy and acceptability of familial searching in Singapore.

4.5 Forensic DNA practices in the Southeast Asian region

"In this age of globalization, cooperation and collaboration between regional countries becomes of utmost important. This is particularly where crimes and criminal activities are no longer limited by

[26] Protocols can be downloaded at: http://www.denverda.org/dna/Familial_DNA_Database_Searches.htm (accessed 8 November 2012).

[27] Such will even more be the case if the Utilizing DNA Technology to Solve Cold Cases Act of 2011 becomes enacted, as the Bill proposes the legal requirement to report on familial searching annually. The report should be submitted to the Committee on the Judiciary of the House of Representatives and the Committee on the Judiciary of the Senate, the minimum requirements for such report are proposed to include: "(1) The number of familial searches requested by CODIS State administrators or State attorney generals. (2) The number of familial searches conducted under this section. (3) The number of familial matches found as a result of such searches. (4) The status of any case in which such a familial match was found" (US Congress 2011). In addition to this information, sound assessment of familial searching practices with regard to its proportionality necessarily requires information about the total amount of investigations against persons and families, interrogations of these 'persons and families of interest', and arrests of suspect persons and families.

the physical borders."[28] Such reads the introduction of the website of the Asian Forensic Sciences Network (AFSN), which became established in 2008 by representatives of forensic science institutes from Brunei, Malaysia, Philippines, Singapore, Thailand and Vietnam. In subsequent years, forensic science institutes of Indonesia, South Korea, Laos, and China also became AFSN members. Apart from Singapore, only South Korea is reported as having a forensic DNA database (INTERPOL 2008). However, Southeast Asian jurisdictions like Indonesia, Malaysia, Philippines, and Thailand already have forensic DNA laboratories and are in the process of setting up national DNA databases. For example, pending in the Philippines is a legal framework for the governance of forensic DNA practices (the "DNA Analysis Enhancement Act of 2010", for further discussion see De Ungria and Jose 2010), and Malaysia, after years of postponing it, enacted its "Deoxyribonucleic Acid (DNA) Identification Regulations" on 1 September 2012. The latter governs among others Malaysia's forensic DNA databank.[29] In addition to these two jurisdictions, Thailand, Brunei and Indonesia all stated that they desire a DNA database yet no public available documents indicate that they have succeeded thus far.[30]

Based on these national efforts and the AFSN's commitment to furthering regional cooperation and collaboration as well as the standardized DNA typing kits which are being utilized all over the world and digitally managed with the aforementioned CODIS software, it is assumed that AFSN members are considering the possibility of transnational exchange of DNA data in the short or mid-term future. Least to say that Singapore makes an interesting 'partner' for such exchange as it has a high influx of foreign labour who may commit crimes in Singapore but never were arrested. And given the substantial national database of Singapore, the neighbouring countries shall be interested to search the Singapore database for matches with known individuals.

Transnational exchange of DNA data can be achieved through various mechanisms. A first such mechanism was launched in 2005 by INTERPOL when it set up the 'DNA Gateway'. The DNA Gateway is a centrally administered 'stand-alone' database to which INTERPOL member countries can voluntarily upload DNA profiles from subjects, traces, missing persons and unidentified bodies (INTERPOL 2011; McCartney et al 2011). Another model for the exchange of DNA profiles is the so-called Prüm Decision, which became effective in 2008 and is aimed at enhancing cross-border cooperation in the EU, "particularly in combating terrorism, cross-border crime and illegal migration" (EU Council 2008; Prainsack and Toom 2010, 2013). An important trait of the Prüm Decision is that it is European Union legislation which can and will be enforced by the European Union upon the member countries. Another aspect of the Prüm regime is that the exchange occurs on a daily basis and is fully automatic. A pitfall of the Prüm Decision was that European Union Parliament as well as national Parliaments of member states were sidestepped when it was decided to adopt the Prüm regime; it has consequently been criticized as lacking legitimacy, transparency and acceptability (Bellanova 2008; McCartney et al 2011). Inspired by the Prüm Decision, the USA currently seeks bilateral agreements in the "Agreement on Preventing and Combating of Serious

[28] http://www.asianforensic.net/background.html (accessed 8 November 2012).
[29] http://iplawmalaysia.com/legislation/deoxyribonucleic-acid-dna-identification-regulations-2012-179.html (accessed 4 October 2012).
[30] Evidence was found that Thailand commenced its "DNA Identification Act of 2010" on 1 January 2012 (see http://www.thai-senate.com/senate_inter/upload-download/translation/show_file.php?id=169, accessed 8 November 2012). However, no further reference to this law or a Thai DNA database has been identified.

Crimes" with individual jurisdictions by making accessible biometrical data, including DNA, held on national databases.[31]

If member states of AFSN decide that transnational exchange of DNA data is viable, and if this is supported by the various governments, than they may decide to model transnational exchange in the Southeast Asian region according to the Prüm model (automatic, obligatory), the INTERPOL model (analogue, voluntarily) or a mixture of both systems. It remains to be seen whether or not Singapore and the other Southeast Asian countries will decide to commence transnational DNA exchange routinely. Before any decision would be made, AFSN members should be encouraged to not only look at mechanisms for transnational exchange, but also advocate further discussion to convince several national constituencies and other stakeholders about the (perceived) necessity for, and legitimacy and acceptability of, transnational exchange. In this process of moral and factual persuasion, organisational principles like due process, individual rights, transparency and accountability will certainly add to making a compelling argument for transnational DNA exchange. Such process of persuasion is only meaningful if more information about *inter alia* transnational crime in the Southeast Asian region, the various rules for inclusion in databases, and quality and democratic control of exchange becomes available.

5. Trumping communitarianism

Liberalism and communitarianism have figured prominently in discussions how to govern forensic DNA practices. Despite the prominence of these two political philosophies and their underlying values, no studies have looked at the governance of forensic DNA practices in a country governed according a communitarian logic. To fill this lacuna in the literature, this article considered Singapore as a country governed according such logic. Etzioni (2006: 215) advocates the "good communitarian society" which is characterized by a conscientious weighing of rights of the individual and communal needs as well as that the community should be morally persuaded and subsequently accept that balance.

On first sight, individual rights and communal needs in Singapore's forensic DNA practices are 'balanced' not least since Singapore rolled out forensic DNA practices in quite similar ways as liberal democratic countries. Yet Singapore's government is rolling out forensic DNA practices at a much faster pace: early 2012, Singapore's national DNA database already contained a similar proportion of its population when compared with the American CODIS yet achieved this in a shorter time span; it was also demonstrated that Singapore's DNA database may outgrow the English NDNAD eventually. Furthermore, Singapore is regarded one of the safest countries in the world, consequently having (statistically) fewer subjects whose DNA would potentially be included in a criminal database. The

[31] Agreements were made between the US and (at least) Belgium, Austria, Switzerland, Czech, Germany, the Netherlands, Finland, Spain, Estonia, Greece, Denmark and South Korea. These agreements still have to be ratified by the national Parliaments – it is currently unknown if and when the agreements come into force, see http://www.justice.gov/opa/pr/2011/September/11-ag-1212.html (accessed 10 October 2012). The Dutch Parliament currently considers the Agreement between the Government of the Kingdom of the Netherlands and the Government of the United States of America on enhancing cooperation in preventing and combating serious crime, see https://zoek.officielebekendmakingen.nl/dossier/33603/trb-2010-321.html and https://zoek.officielebekendmakingen.nl/dossier/33603 (accessed 12 June 2013).

most logical explanation for Singapore's rather quick expanding DNA database is hence that inclusion criteria are very broadly formulated, and that law enforcement officials have embraced a policy of swabbing a considerable part of the population.[32] Hence, based on these provisional interpretations, and in comparison with the USA and England, Singapore's approach to policy and governance of forensic DNA practices is communitarian as it is favouring the common good and social responsibility over liberty and individual rights. It is however debatable whether or not its inclusion regime, at least from a liberal democratic point of view, is imbalanced and disproportional.

Etzioni's second yardstick leaves less room for discussion and interpretation. Although the very restrictive rules for inclusion in Singapore's DNA database were accepted after Parliamentarian scrutiny, exact data about current practice have never been published or made available publicly: it is unknown how many subject profiles are uploaded annually, how many profiles of cleared suspects were removed, how many juveniles are included in the database, how many crime scene profiles are uploaded annually, in how many cases the database provides investigative leads and how many of those leads lead to a successful prosecution. Furthermore, it is currently unknown how data in the database is applied exactly, and for what other purposes the database and forensic biobank are being utilized. Applications and purpose are important here, not only since familial searching and transnational exchange are controversial, but also because the forensic biobank – containing DNA samples of everyone arrested after 2003 – *may* be used for scientific research or even biomedical research; such would be a gross violation of bioethical values. Echoing the concept of biolegality (Lynch and McNally 2009; Lawless 2013), these instances articulate only the *bio* without *legality*.

Summarizing the above, it can be concluded that Singapore's government is deficient in providing any meaningful information about its forensic DNA practices. Second, the government is unwilling to adhere to governing principles like transparency and accountability. Third, and related to the former, Singapore's citizenry cannot be persuaded about a balanced forensic DNA practice where individual rights (privacy, bodily integrity) are made secondary to the common good in narrowly defined and agreed upon circumstances. And fourth, some applications and purposes may be practiced without designated legislation rendering it into extra-legal practices. It is therefore safe to say that forensic DNA practices in Singapore are not so much governed according versions of communitarianism. Instead, communitarianism is trumped by the crime control model; the common good is defined as 'safety' and the 'war against crime and terrorism' at the expense of individual rights (i.e. privacy, bodily integrity) and legal principles (i.e. proportionality, presumption of innocence, and onus of proof). In contrast with liberal democratic articulations of biolegality, which are intimately connected with civil liberties and restrictions to those liberties in accordance with a nation's Code of Criminal Procedure (Toom 2012b), Singapore's biolegality may be considered an articulation of the Penal Code and its policing practices. In other words, the latter's biolegal progress is by and large steered by a list of punishable crimes whereas the former are the result of exceptions to individual rights.

This article favours a liberalist and due process governance model for forensic DNA practices. Yet it remains an open question under what situated conditions subjects living in a state where forensic DNA practices are governed according the crime control model find themselves empowered or

[32] Of course other explanations are also possible, for example that all criminals are caught by the Singapore police and successfully prosecuted and thus convicted.

disempowered by DNA typing technologies (see Prainsack and Toom 2010). Were any scholars to conduct further research into forensic DNA practices in countries other than liberal democracies, then a focus on specific groups (e.g. minorities, refugees, inmates) disproportionately affected by these technologies may overcome the unwillingness of government officials to share knowledge of the effects of their forensic DNA regimes (*c.f.* Cole 2007; Prainsack and Kitzberger 2009; Machado et al 2011; Machado and Prainsack 2012). Centre staging groups, and documenting under what circumstances such groups feel empowered or disempowered *exactly* by a state's apparatus may bring to the fore how individuals' bodies are being subjected by science and law, how subjectivities are produced and become enacted, or how surveillance may be resisted or used to one's advantage. Such further studies should not only consider forensic DNA technologies, but also examine how those states and their governance principles and mechanisms contribute to the ordering of power relations between the state and its subjects. Another significant issue regards trust, in particular how trust is engaged by those who promote crime control values at the expense of due process ones? Or do Singaporeans not so much trust law enforcement agencies and instead rely on forensic DNA typing technologies which, in this era of forensic fictions like *CSI: Crime Scene Investigation* and *Bones*, are often perceived as infallible truth machines with the capacity to correct an unduly powerful state utilizing the crime control model? It may be possible that Singapore's citizenry finds it comforting that forensic DNA typing technologies' epistemological authority stands between them, the state, and the crime control model.

References

AGC 2012. *Press Release 3 January: Laboratory incident affecting results of DNA testing*. Singapore: Attorney-General's Chambers.

Aronson, J. 2007. *Genetic Witness. Science, Law, and Controversy in the Making of DNA Profiling*. New Brunswick: Rutgers University Press.

Aronson, J. D. 2010. "On trial! Governing forensic DNA technologies in the United States." in Hindmarsh, R. and Prainsack, B. (eds.), *Genetic Suspects. Global Governance of Forensic DNA Profiling and Databasing,* 240-261. Cambridge: Cambridge University Press.

Bellanova, R. 2008. "The 'Prüm Process'': The Way Forward for EU Police Cooperation and Data Exchange." in Guild, E. and Geyer, F. (eds.), *Security Versus Justice? Police and Judicial Cooperation in the European Union,* Farnham, Surrey: Ashgate.

Beyleveld, D. 1997. "Ethical issues in the forensic application of DNA analysis." *Forensic Science International* 88: 3-15.

Bieber, F. R., Brenner, C. and Lazer, D. 2006. "Finding criminals through DNA of their relatives." *Science* 312: 1315-1316.

Chua, L. J. and Shing, K. 2003. "Saying No: Sections 377 and 377A of the Penal Code." *Singapore Journal of Legal Studies*: 209-261.

Cole, S. A. 2007. "How much justice can technology afford? The impact of DNA technology on equal criminal justice." *Science and Public Policy* 34: 95-107.

Cole, S. A. and Lynch, M. 2006. "The social and legal construction of suspects." *Annual Review of Law and Social Science* 2: 39-60.

Court of Appeal 2011. *Muhammad bin Kader and another v Public Prosecutor, SGCA 32, Criminal Appeal No 8 of 2009*. Singapore: Court of Appeal.

Curran, J. M. and Buckleton, J. S. 2008. "Effectiveness of familial searches." *Science & Justice* 84: 164-167.

Dahl, R. A. 1998. *On Democracy*. New Haven & London: Yale University Press.

Dajani, H. 2011. "Forensic evidence traps more criminals in UAE (18 January)." *The National*.

De Ungria, M. C. and Jose, J. M. 2010. "Forensic DNA profiling and databasing: the Philippines experience." in Hindmarsh, R. and Prainsack, B. (eds.), *Genetic Suspects. Global Governance of Forensic DNA Profiling and Databasing* Cambridge: Cambridge University Press.

Dee, S. T. 2007. "53,000 Samples in DNA Database (December 28)." *Straits Times*.

ECtHR 2008. *Case of S. and Marper v the United Kingdom, Applications nos. 30562/04 and 30566/04, 4 December*. Strasbourg: European Court of Human Rights.

ENFSI 2012. *DNA Database Management. Review and Recommendation*. Europe: European Network of Forensic Science Institutes.

Etzioni, A. 2004. "DNA tests and DNA databases in criminal justice: individual rights and the common good." in Lazer, D. (ed.), *DNA and the Criminal Justice System. The Technology of Justice,* Cambridge; London: The MIT Press.

Etzioni, A. 2006. "A Communitarian Approach: A viewpoint on the study of the legal, ethical and policy considerations raised by DNA tests and databases." *The Journal of Law, Medicine & Ethics* 34: 214-221.

Etzioni, A. 2011. "Authoritarian versus responsive communitarian bioethics." *Journal of Medical Ethics* 37: 17-23.

EU Council 2008. "Council Decision 2008/615/JHA, of 23 June 2008, on the stepping up of cross-border cooperation, particularly in combating terrorism and cross-border crime." *Official Journal of the European Union* L210: 1-11.

EU Council 2009. "Council Resolution of 30 November 2009 on the exchange of DNA analysis results (2009/C 296/01)." *Official Journal of the European Union* 52: 1-31.

Fitzgerald, R. and Ellsworth, P. 1984. "Due process vs. crime control." *Law and Human Behavior* 8: 31-51.

Gill, P., Sparkes, R., Fereday, L. and Werrett, D. J. 2000. "Report of the European Network of Forensic Science Institutes (ENSFI): formulation and testing of principles to evaluate STR multiplexes." *Forensic Science International* 108: 1-29.

Goulka, J., Matthies, C., Disley, E. and Steinberg, P. 2010. *Toward a Comparison of DNA Profiling and Databases in the United States and England*. Santa Monica, CA: RAND Corporation.

Haimes, E. 2006. "Social and ethical issues of familial searching in forensic investigations: Insights from family and kinship studies." *Journal of Medicine, Law and Ethics* 34: 263-276.

Heinemann, T., Lemke, T. and Prainsack, B. "Risky profiles: societal dimensions of forensic uses of DNA profiling technologies." *New Genetics and Society* 31: 249-258.

Hindmarsh, R. and Prainsack, B. (eds.) 2010. *Genetic Suspects. Global Governance of Forensic DNA Profiling and Databasing*. Cambridge: Cambridge University Press.

Ho, A. 2012. "The case for post-conviction DNA testing (January 14)." *The Straits Times*.

Ho, H. L. 2010. "Liberalism and the criminal trial." *Sydney Law Review* 32: 243-256.

Home Office 2006. *Tactical Advice. Using Familial DNA Intelligence Products in Serious Crime Investigations*. London: Home Office.

Hor, M. 2001. "Singapore's Innovations to Due Process." *Criminal Law Forum* 12: 25-40.

Hor, M. 2004. "The death penalty in Singapore and international law." *Singapore Year Book of International Law* 8: 105-117.

HSA 2011. *Transformation Through Synergy. Health Science Authority Annual Report 2010/11*. Singapore: Health Sciences Authority.

HSA 2012. *Press Release 3 January: HSA Re-tests DNA Cases As A Precautionary Measure*. Singapore: Health Sciences Authority.

Human Genetics Commission 2009. *Nothing to Hide, Nothing to Fear? Balancing Individual Rights and the Public Interest in the Governance and Use of the National DNA Database*. London: Human Genetics Commission.

INTERPOL 2008. *Interpol Global DNA Profiling Survey*. Lyon: INTERPOL.

INTERPOL 2011. *DNA Profiling - Fact Sheet*. Lyon: INTERPOL.

Jasanoff, S. 1998. "The eye of everyman: witnessing DNA in the Simpson trial." *Social Studies of Science* 28: 713.

Jasanoff, S. 2010. "Foreword." in Hindmarsh, R. and Prainsack, B. (eds.), *Genetic Suspects. Global Governance of Forensic DNA Profiling and Databasing,* xix-xxiv. Cambridge: Cambridge University Press.

Jeffreys, A. J., Wilson, V. and Thein, S. L. 1985. "Hypervariable 'minisatelite' regions in human DNA." *Nature* 314: 67-73.

Kayser, M. and Schneider, P. M. 2009. "DNA-based prediction of human externally visible characteristics in forensics: motivations, scientific challenges, and ethical considerations." *Forensic Science International: Genetics* 3: 154-161.

Keong, C. S. 2000. "Rethinking the Criminal Justice System of Singapore for the 21st Century." *Singapore Academy of Law,* 29-58. Singapore.

Khalik, S. 2012. "To err is human, to confess remarkable (5 January)." *The Straits Times*.

Krimsky, S. and Simoncelli, T. 2011. *Genetic Justice. DNA Databanks, Criminal Investigations, and Civil Liberties.* . New York: Columbia University Press.

Lander, E. S. 1989. "DNA fingerprinting on trial." *Nature* 339: 501-505.

Lawless, C. J. 2013. "The low template DNA profiling controversy: Biolegality and boundary work among forensic scientists." *Social Studies of Science* 43: 191-214.

Lee, M. and Laidler, K. J. 2013. "Doing criminology from the periphery: Crime and punishment in Asia." *Theoretical Criminology* 17: 141-157.

Lee, Y. C. L. 2008. "'Don't Ever Take a Fence Down Until You Know the Reason it Was Put Up' - Singapore Communitarianism and the Case for Conserving 377A." *Singapore Journal of Legal Studies*: 347-394.

Lynch, M., Cole, S., McNally, R. and Jordan, K. 2008. *Truth Machine. The Contentious History of DNA Fingerprinting*. Chicago & London: The University of Chicago Press.

Lynch, M. and McNally, R. 2009. "Forensic DNA databases: the co-production of law and surveillance technologies." in Atkinson, P., Glasner, P. and Lock, M. (eds.), *Handbook of Genetics and Society. Mapping the New Genomic Era,* London: Routledge.

M'charek, A. 2008. "Silent witness, articulate collectives: DNA evidence and the inference of visible traits." *Bioethics* 22: 519-528.

M'charek, A., Toom, V. and Prainsack, B. 2012. "Bracketing off populations does not advance ethical reflection on EVCs." *Forensic Science International: Genetics* 6: e16-e17.

Machado, H. and Prainsack, B. 2012. *Tracing Technologies: Prisoners' Views in the Era of CSI*. Surrey: Ashgate Publishing.

Machado, H., Santos, F. and Silva, S. 2011. "Prisoners' expectations of the national forensic DNA database: Surveillance and reconfiguration of individual rights." *Forensic Science International* 210: 139-143.

McCartney, C. 2012. "Of Weighty Reasons and Indiscriminate Blankets: The Retention of DNA for Forensic Purposes." *The Howard Journal of Criminal Justice* 51: 245-260.

McCartney, C., Williams, R. and Wilson, T. J. 2010. *The Future of Forensic Bioinformation*. London: Nuffield Foundation.

McCartney, C., Wilson, T. J. and Williams, R. 2011. "Transnational exchange of forensic DNA: viability, legitimacy, and acceptability." *European Journal on Criminal Policy and Research* 17: 305-322.

Mullis, K. B. 1990. "The unusual origin of the polymerase chain reaction." *Scientific American* 262: 36-43.

Murphy, E. 2010. "Relative doubt: Familial searches of DNA databases." *Michigan Law Review* 109: 291-348.

Nuffield Council on Bioethics 2007. *The Forensic Uses of Bioinformation: Ethical Issues*. London: The Nuffield Council.

O'Dwyer, S. 2003. "Democracy and Confucian values." *Philosophy East and West* 53: 39-63.

Ortmann, S. 2011. "Singapore: authoritarian but newly competitive." *Journal of Democracy* 22: 153-164.

Ossorio, P. N. and Duster, T. 2005. "Race and genetics: controversies in biomedical, behavioral, and forensic science." *American Psychologist* 60: 115-128.

Parliamentary Debates 2004. *Criminal Law (Temporary Provisions) Bill - Second Reading), Col. 388-407, 1 September 2004*. Singapore: Parliament.

Parven, K. 2012. *Forensic Use of DNA Information. Human rights, privacy and other challenges (PhD thesis)*. Wollongong: University of Wollongong.

Prainsack, B. and Kitzberger, M. 2009. "DNA behind bars: other ways of knowing forensic DNA technologies." *Social Studies of Science* 39: 51-79.

Prainsack, B. and Toom, V. 2010. "The Prüm regime: Situated dis/empowerment in transnational DNA profile exchange." *British Journal of Criminology* 50: 1117-1135.

Prainsack, B. and Toom, V. 2013. "Performing the Union: The Prüm Decision and the European dream." *Studies in History and Philosophy of Biological and Biomedical Sciences* 44: 71-79.

Quek, C. 2009. "DNA records help to solve 350 crimes. Database started six years ago and now has 100,000 samples (October 9)." *The Straits Times*.

Rabinow, P. 1996. *Making PCR. A Story of Biotechnology*. Chicago & London: University of Chicago Press.

Republic of Singapore 2002. "Registration of Criminals (Amendment) Act 2002 (No. 45 of 2002)." *The Government Gazette*.

Scheck, B., Neufeld, P. and Dwyer, J. 2000. *Actual Innocence. Five days to execution, and other dispatches from the wrongly convicted*. New York: Doubleday.

Schedler, A. 2009. "Electoral authoritarianism." in Landman, T. and Robinson, N. (eds.), *The SAGE Handbook of Comparative Politics,* London: SAGE.

Siyuan, C. and Chua, E. 2010. "Wrongfull convictions in Singapore: A general survey of risk factors." *Singapore Law Review* 28: 98-123.

Skinner, D. 2011. "Mobile Identities and Fixed Categories: Forensic DNA and the Politics of Racialised Data." in Schramm, K., Skinner, D. and Rottenburg, R. (eds.), *Identity Politics After DNA: Re/Creating Categories of Difference and Belonging: Re/Creating Categories of Difference and Belonging,* New York: Berghahn.

Supreme Court of the United States 2013. *Maryland v. King, No 12-207, Decided June 3*. Washington DC: Supreme Court of the United States.

Tan-Siew, W. F., Liang-Sung, C. L., Seng, S. L. E., Kim, D. N. K. and Tse, C. S. 2007. *The Singapore National DNA Database Laboratory*. Singapore: Health Sciences Authority.

Tan, E. K.-B. 2000. "Law and values in governance: the Singapore way." *Hong Kong Law Journal* 30: 91-119.

Toom, V. 2012a. "Bodies of science and law: forensic DNA profiling, biological bodies and biopower." *Journal of Law and Society* 39: 150-166.

Toom, V. 2012b. "Forensic DNA databases in England and the Netherlands: governance, structure and performance compared." *New Genetics and Society* 31: 311-322.

USA Congress 2011. *Utilizing DNA Technology to Solve Cold Cases Act of 2010, H.R. 6011*. Washington: House of Representatives.

Van Houdt, F. and Schinkel, W. 2013. "A genealogy of neoliberal communitarianism." *Theoretical Criminology* Online first: DOI: 10.1177/1362480613485768.

Williams, R. and Johnson, P. 2004. "Circuits of surveillance." *Surveillance and society* 2: 1-14.

Williams, R. and Johnson, P. 2006. "Inclusiveness, effectiveness and intrusiveness: issues in the developing uses of DNA profiling in support of criminal investigations." *The Journal of Law, Medicine & Ethics* 34: 234-247.

Williams, R. and Johnson, P. 2008. *Genetic Policing. The Use of DNA in Criminal Investigations*. Cullompton, Devon: Willan Publishing.

Youssef, M. 2009. "DNA database to start in a year (October 7)." *The National*.

Yuen-C, T. 2012. "Gan apologises over DNA lab blunder by HSA (5 January) " *The Straits Times*.

Zakaria, F. 1994. "Culture is destiny: a conversation with Lee Kuan Yew." *Foreign Affairs* 73: 109-126.