Silent witness, articulate collective: DNA evidence and the inference of visible traits

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SILENT WITNESS, ARTICULATE COLLECTIVE: DNA EVIDENCE AND THE INFERENCE OF VISIBLE TRAITS

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ABSTRACT
DNA profiling is a well-established technology for use in the criminal justice system, both in courtrooms and elsewhere. The fact that DNA profiles are based on non-coding DNA and do not reveal details about the physical appearance of an individual has contributed to the acceptability of this type of evidence. Its success in criminal investigation, combined with major innovations in the field of genetics, have contributed to a change of role for this type of evidence. Nowadays DNA evidence is not merely about identification, where trace evidence is compared to a sample taken from a suspect. An ever-growing role is anticipated for DNA profiling as an investigative tool, a technique aimed at generating a suspect where there is none. One of these applications is the inference of visible traits. As this article will show, racial classifications are at the heart of this application. The Netherlands and its legal regulation of 'externally visible traits' will serve as an example. It will be shown that, to make this technology work, a large number of actors has to be enrolled and their articulations invited. This indicates that instead of a 'silent witness', a DNA profile should rather be seen as an 'articulate collective'. Based on two cases, I argue that the normativity of visible traits is context-dependent. Taking into account the practices in which technology is put to use alerts us to novel ethical questions raised by their application.

1. INTRODUCTION

The first case of DNA profiling occurred in the context of a family reunion. In 1984, the population geneticist Sir Alec Jeffreys showed that a young man who was living in Ghana was the biological son of a woman, and the brother of her three children, who were all living in the UK.[1] Quite soon, questions were raised about whether the same technology could be applied to establish another kind of link. Instead of identifying relations among individuals, could DNA be used to link a biological trace found at a crime scene with an individual who may have been involved in the crime under investigation? Following its introduction into forensic practice, the technology has proved highly successful; but it has also been the focus of much debate. In the early 1990s, the debate focused on two major topics. The first concerned the soundness of the scientific methods and robustness of the

[1] A.J. Jeffreys, V. Wilson & S.L. Thein. Hypervariable 'Ministallites' Regions in Human DNA. *Nature* 1985; 314: 67–73; A. J. Jeffreys, M. Turner & P. Debenham. The Efficiency of Multilocus DNA Fingerprint Probes for Individualisation and Establishment of Family Relationships, Determined from Extensive Casework *Am J Hum Genet* 1991; 48: 824–840.

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technologies. Does the technology actually deliver what it promises, namely individualization?[2] The second concerned the so-called population substructure problem, which raised questions about the biases that genetic markers may show when applied to different populations.[3] Forensic genetics has since overcome these problems. Standard protocols have been introduced for handling the delicate evidence samples in the laboratories – addressing concerns about robustness – and specific statistical methods have been implemented to address population concerns by calculating the matching likelihood probability and introducing more genetic markers.[4]

The availability of novel technologies has contributed to the prominent role that forensic DNA currently plays in criminal investigations. More sensitive PCR-based methods, along with the introduction of multiplex marker kits, have made it possible to analyse minute and even degenerated biological trace evidence. In addition, the introduction of capillary DNA sequencing machines, which process samples at much higher rates, the compilation of DNA databanks, and further standardization of working procedures in and outside the laboratories (e.g. for collecting and storing trace evidence collected at crime scenes), have, together, helped to increase the volume of DNA profiles produced.

At the same time, these possibilities have raised novel politico-ethical problems. These problems can be clustered under the heading: 'DNA profiling as an investigative tool'. In its early days, DNA evidence functioned as an identification technology. There was a suspect and a biological trace, and the question was whether a match could be established between the two. This function of DNA evidence remains vital. The availability of large databanks, however, has made it possible to generate a suspect where there is none by finding a match between a profile from trace-evidence and a profile in the databank. Moreover, since the databanks consist not only of digital information (DNA profiles), but also of DNA samples, there have been attempts to use these large collections for research purposes.[5] This has raised questions about informed consent, privacy, ownership of the samples and accountability.[6] Finally, searching the databank for possible 'low stringency' matches has posed the novel problem of so-called familial searching. Suppose, for example, that a comparison produces a partial match. This might be taken to indicate that a full match could be found with a family member of the individual in the databank.

This approach offers no guarantees, however, and subjecting family members to an invasive investigation on such grounds poses a number of ethical questions. These include for example, the privacy issues raised when persons whose DNA profiles are in the databanks become responsible for the privacy of their family members.[7] Three additional applications of DNA technologies raise problems about race-based classification. Dragnets, for example, are widespread DNA tests among a target population. In a recent article, Ossorio and Duster showed that in the US, where such dragnets had been applied, in approximately twelve cases they were guided by racial prejudices. In the cases they review, eyewitness accounts led to racially oriented dragnets in which members of target populations were requested to provide samples 'voluntarily' for DNA analysis. The outrage inspired by such dragnets has led crime investigators in some criminal jurisdictions to abandon the strategy.[8]

Inference of ethnicity from a trace sample is a related approach. Here, the inference of ethnicity is derived from a *statistical* process aimed at the ethnic (often geographic) descent of the suspect with the goal of reducing the target population to be investigated by the police. The clustering of individuals in population genetics might differ greatly from that in police investigations or in society at large, however.[9] In addition, physical appearance is subject to various environmental and socio-economic factors that are not reflected in the genes.[10] The third –

[2] For an exemplary case that prompted this question, see E. Lander. 1992. DNA Fingerprinting: Science, Law, and the Ultimate Identifier. In *The Code of Codes: Scientific and Social Issues in the Human Genome Project*. D. Kevles and L. Hood, eds. Cambridge, Massachusetts: Harvard University Press: 191–210; see also National Research Council. 1992. *DNA Technology in Forensic Science*. Washington, DC: National Academy Press.

[3] R.C. Lewontin & D.L. Hartl. Population Genetics in Forensic DNA Typing. *Science* 1991; 254: 1745–1750. National Research Council. 1992. *DNA Technology in Forensic Science*. Washington, D.C.: National Academy Press. A. M'charek. Technologies of Population: Forensic DNA Testing Practices and the Making of Differences and Similarities. *Configurations* 2000; 8: 121–158.

[4] National Research Council. 1996. *The Evaluation of Forensic DNA Evidence*. Washington, D.C.: National Academy Press. A. M'charek. 2005. Populatie in het Forensisch DNA-Onderzoek: Van Probleem naar Mogelijkheid?. In *Ethiek van DNA tot 9/11*. J. Breakman, B. Reuver and T. Vervisch, eds. Amsterdam: Amsterdam University Press: 99–119.

[5] For the US case, see P.N. Ossorio & T. Duster. Race and Genetics: Controversies in Biomedical, Behavioral, and Forensic Science. *Am Psychol* 2005; 60: 115–128.

[6] For an ethical evaluation, see Nuffield Council on Bioethics. 2007. *The Forensic Use of Bioinformation: Ethical Issues.* London: Nuffield Council on Bioethics.

[7] Ibid: 78–80.

[8] Ossorio & Duster, *op. cit.* note 5.

[9] M. Cho & P. Sankar. Forensic Genetics and Ethical, Legal and Social Implications Beyond the Clinic. *Nat Genet* 2004; 36: 8–12.

[10] See Nuffield Council on Bioethics, *op. cit.*, note 6, p. 80–82. See also P.N. Ossorio. About Face: Forensic Genetic Testing for Race and Visible Traits. *J Law Med Ethics* 2006; 34: 277–293.

related – racial application of technology concerns the inference of visible traits from DNA. This technology and its implications are examined below.

The inference of ethnicity differs from the inference of visible traits in that the former is based on non-coding DNA, whereas the latter is based on genes that code for (facial) phenotypes. The technology promises no less than a 'composition drawing' or 'photofit'. Photofits are normally based on eyewitness accounts. Here, however, trace evidence collected at a crime scene, a 'silent witness', is called in to help out.

The availability of such a silent witness is a central principle in the practice of forensics formalized in the Locard Exchange Principle. It reads:

> Wherever he steps, whatever he touches, whatever he leaves, even unconsciously, will serve as a silent witness against him. [. . .] This is evidence that does not forget. It is not confused by the excitement of the moment. It is not absent because human witnesses are. It is factual evidence. Physical evidence cannot be wrong, it cannot perjure itself, it cannot be wholly absent.[11]

This Principle is generally referred to in terms like 'every contact leaves a trace'. Traces collected at crime scenes can give hints about 'what happened?' and 'who done it?'. Trace evidence is commonly referred to as a *silent witness*. The name suggests a role for science, of making such 'factual evidence' speak. Although imaginative and popular, the notion of a silent witness backgrounds the politico-ethical content of forensic investigation, the politico-ethical content that a DNA profile carries with itself. Scientific and technical interventions thus seem no more than a helping hand that assists in retrieving the story of a criminal act from traces left at the crime scene.

In this paper I argue that rather than a silent witness, a DNA profile should be seen as an *articulate collective*. This characterization stresses two features of DNA profiles. First, that they *articulate* in the sense that such profiles are not neutral and docile objects, but normative and active ones. They make specific links between different sites and actors and order the relations between them (e.g. the relations between the different actors involved in the chain of custody, or, that between individuals identified).[12] Second, as *collective* rather than singular objects – say a representation of the DNA of an individual – DNA profiles should be viewed as 'heterogeneous networks of relations' that draw together a variety of humans and things in rather fluid configurations.[13] Depending on where and which version of the profile is being performed (say a number of peaks on a computer screen in a laboratory, a matching probability number in court, or *the* identity of the unknown suspect in a criminal investigation) other actors might be made part of what a profile is. In addition, profiles also draw together the norms and goals of actors, as in the chain of custody. Even though it orders this chain, a DNA profile is also dependent on the intactness of the chain and the way it is documented in court.[14] Performing this chain keeps the DNA profile from falling apart and helps maintain its identity as a singular object. To be sure, the collective drawn together in a DNA profile, as well as the normative content it articulates, is neither fixed nor stable.

The last part of this paper will examine cases where forensic evidence went public, drawing in an ever-growing number of actors; cases where the normativities articulated have become rather loud. I will argue that such cases urge us to invent a broader approach to ethics. Not merely an ethics that assesses the social effects of technology before they are put to use, but rather one that can deal with the open-endedness of technologies and can take the practices in which the technologies are used into account. Before turning to these questions, I review the legal and scientific context of DNA evidence, with a special focus on the inference of visible traits using the Netherlands as an example.

2. LAW

In the context of forensic DNA, the Netherlands is an interesting case. In 1994 it became the first country to introduce specific legislation to regulate the use of evidence DNA; more recently the Netherlands has been introducing laws and amendments at high speed. Five regulations aimed at broadening the use of forensic DNA have been passed and another is in preparation. Here I will consider only the first three regulations: the law of 1994 and the amendments of 2001 and 2003.

In the late 1980s, DNA evidence had been taken from suspects in several cases, but always on a voluntary basis.

[11] Edmond Locard cited on: http://en.wikipedia.org/wiki/Locard%27s_exchange_principle [Accessed 28 Jan 2008].

[12] This take on objects is well elaborated in the science and technology studies (STS). See for examples on normativity: A. Mol. 2002. *The Body Multiple: Ontology in Medical Practice*. Durham, NC: Duke University Press; J. Law. 2002 *Aircraft Stories: Decentering the Object of Technoscience*. Durham, NC: Duke University Press. For the normativity of a DNA profile see P. Rabinow. Galton's Regret: Of Types and Individuals. *Cult Med Psychiatry* 1993; 17: 59–65; M'charek, *op. cit.* note 3.

[13] For this STS notion of objects see, e.g., J. Law, ed. 1991. *A Sociology of Monsters? Essays on Power, Technology and Domination*. London: Routledge.

[14] See for a case in place M. Lynch and R. McNally. Chains of Custody: Visualization, Representation, and Accountability in the Processing of Forensic DNA Evidence. *Comm Cogn* 2005; 38: 297–318.

In 1990, however, a case was issued in the city of Maastricht where a suspect in a rape and murder case was not willing to supply a blood or saliva sample for DNA analysis. This case was eventually argued before the Supreme Court, which rendered the so-called 'saliva-decree'.[15] The Court ruled that article 11 of the Dutch Constitution protects the integrity of the human body and that forcing a person to contribute bodily samples would constitute a violation of this basic right. A change of law would be required to force a suspect to contribute material for a DNA analysis. Upon this ruling, the Minister of Justice installed a committee to review the Criminal Code and to suggest new legislation. In September 1994 the first DNA law was enacted.[16]

Since this law constitutes a violation of the human body, much effort has been given to protecting the rights of a suspect. For example, DNA analysis can only be requested in those 'severe' criminal cases, such as rape or murder, which can lead to eight or more years of detention. Only an Examining Magistrate can request a DNA analysis and thus force a suspect to submit a blood sample for such purposes. Suspects have a legal right to counter-expertise, and, in cases where very little evidential material is available (i.e. cases where the evidence material does not allow for a second DNA analysis) the suspect has the right to decide which laboratory should conduct the analysis. This right of choice is practically constrained, however, since only two laboratories are legally approved for producing DNA analysis for forensic purposes. These laboratories have both been legally designated by the Minister of Justice and certified by a board of accreditation.

Quite soon after its implementation various actors had started to criticize this DNA law as being too restrictive. Forensic scientists, police investigators and some politicians were arguing for broadening the use of DNA evidence, but it would take seven more years before amendments to this law could be passed.

The amendment of 2001 broadened the use of forensic DNA to include so-called 'high volume' crimes where the suspect could be held in custody (i.e. burglaries).[17] This was prompted by the success of DNA evidence in the Netherlands and, even more, by the success of large DNA databanks in other countries, especially the UK. In addition, PCR-based methods and second generation multiplex marker kits (SGM+) have made it possible to produce trustworthy DNA analyses from ever smaller traces of bodily material. Saliva instead of blood became feasible as the standard method to produce DNA profiles from reference samples taken from suspects.

These technologies have paved the political ground for broadening the application of forensic DNA. Taking a swab from the inner cheek of a person is considered less invasive to bodily integrity than taking blood. However, the standard of the integrity of the body in the law of 1994 was not merely focused on the taking of samples. It also addressed the information that can be found in the DNA. Both the sample and the information retrieved were considered part of the inviolable body. The ease of taking a saliva sample has thus come to play a vital political role in broadening of the use of forensic DNA. Less than the information contained in the DNA, bodily integrity has become a matter of pricking or not pricking. In addition, the 2001 amendment allows that, if necessary, cellular material may be tricked out of the suspect; for example, a suspect may be offered a cup of coffee at the police department and the traces of saliva can be used for DNA analyses.[18]

Broadening the range of application of forensic DNA has led to another change. Not only DNA profiles, but also the DNA samples, were to be stored in databanks. While the profiles are based on non-coding DNA, the availability of the DNA as such makes it possible to study specific traits. Given this risk, the legislature has stated that both the information taken from the DNA and the DNA itself are personal information, protected by the Privacy Law.[19] In order to guarantee the rights of the individual, the Netherlands Forensic Laboratory (where the DNA databanks are based) is subjected to an annual external audit.[20]

Whereas the first amendment to the DNA law took more than seven years, it took only two additional years for a second amendment to be introduced. The amendment of May 2003 regulates the inference of 'visible

[15] Hoge Raad der Nederlanden. Wangslijmvlies Arrest. *NJ* 1990/751. See also V. Toom. DNA Fingerprinting and the Right to Inviolability of the Body and Bodily Integrity in the Netherlands: Convincing Evidence and Proliferating Body Parts. *Genomics Soc Policy* 2006; 2: 64–74.

[16] Besluit DNA-onderzoeken. *Staatsblad*. 1994: 522.

[17] Besluit DNA-onderzoeken in Strafzaken. *Staatsblad*. 2001: 400.

[18] The Minister of Justice indicates the following: 'If the taking of cell material is not feasible because of considerable objections of the suspect (or because the suspect is heavily protesting) it is possible to use cell material that was not actively taken, such as hair or saliva on a coffee-cup', Ministerie van Justitie (2001) 'Nieuwe DNA-wetgeving treedt 1 november in werking' *Persbericht*, 31 oktober. This method had been applied for the first time in the Marianne Vaatstra case. The cigarette butt originating from a suspect who refused to participate in a dragnet was used in the DNA analysis. He was exonerated.

[19] This regulation is quite crucial in terms of privacy and differs from e.g. regulations in the US where DNA samples can be used e.g. in research for improving forensic techniques (Ossorio & Duster, *op. cit.* note 5). For a discussion, see Nuffield Council on Bioethics, *op. cit.* note 6.

[20] Wet van 5 juli 2001 tot wijziging van de regeling van het DNA-onderzoek in strafzaken. *Staatsblad* 2001; 335.

external personal characteristics' from biological samples.[21] Since DNA may also contain unexpected information, the legislature decided to exclude disease genes, including Down syndrome. The amendment specifies physical traits as traits that are 'overtly visible to anybody' and of which 'it can be stated with certainty that the individual involved is aware of them'.[22] Article 151d, section 2 of this legislation specifies that 'DNA research can only be applied to determine the sex, race or other externally visible traits to be pointed out through an Order in Council'.[23] Below, I examine the definition of race at which this law is aimed. The 'other externally visible traits' referenced have been debated in Parliament. They consist, *inter alia*, of hair, eye and skin colour, age and facial shape.

A common complaint is that politics and legislation always lag behind technical developments. Here however, we have full-fledged legislation for technologies that do not yet exist. Except for sex and genealogical descent, the genetic basis of these other characteristics is hardly understood. As noted above, genealogical descent (i.e. the inference of ethnicity) is a matter of statistical probability. Since the targeted technologies are not yet available, the current regulations are framed as 'window-legislation'. Once technologies become available the regulations can be implemented through an 'Order in Council'; no additional parliamentary procedure is required.

This Dutch legislation is somewhat surprising. It regulates virtual and highly controversial technologies. Its unexpected character was captured in a statement from the forensic scientist Mark Benecke in June 2002: 'In Europe it will be impossible to check for genes in criminal investigations; our laws will simply prohibit this for years to come.'[24]

Genetic research, so the law prescribes, can only be requested in severe criminal cases and only when other investigative tools have been exhausted. Yet the legislation expresses a rather naïve wish to go from stripes and peaks on a laboratory computer screen to a 'composition drawing' of a suspect on a TV-screen. These phantom sketches are supposed to help investigators to narrow down their search for suspects. By distributing sketches via the media, investigators can solicit information from the public. However, given the probabilistic nature of a phantom sketch, '[m]aking an ethnic inference may lead police to narrow the focus of their inquiries prematurely in expectation that the offender will come from a particular racial or ethnic group'.[25] And, as we will see below, it may feed prejudices about alleged predispositions to crime among specific populations.

Race is obviously at the heart of the inference of visible traits in forensic science. Yet, as biological race is almost an anathema in the Dutch context, it is surprising to find this concept in the Dutch Criminal Code.[26] So, how did it make its way into that text?

The initial draft of the law included notions of both race and population. The former Minister of Justice argued the following while deciding 'simply' for race:

> The Dutch Law does not have a definition of the notion of 'race'. This notion is primarily applied to assess cases where citizens should be protected against discrimination. To do so the notion is – in accord with the International Treaty *to eliminate all forms of race discrimination* and with jurisprudence – broadly described and includes also: skin colour, ancestry, national or ethnic descent. Given this broad interpretation of the notion, 'population' is a species of the notion 'race'. For reasons of coherence in terminology it seems to me right to comply with the usual explanation of the notion of 'race'. The aim of the present regulation, namely to find out about the identity of a potential suspect of a severe criminal assault, also justifies the broader interpretation. I have therefore decided, by government amendment, to abandon the observable physical trait 'population' and to be content with the broader notion of 'race' (emphasis added).[27]

Ironically, in an effort to define race for the purpose of criminal investigations, the legislator has made use of legal specifications that were originally developed to protect citizens against racism. This is a (puzzling) paradox of anti-racist politics. Regulating what should be understood under racism (discrimination based on *skin colour, ancestry, national or ethnic descent*) provides the case for the legislator to reify biological race and install it in the law as an object of forensic investigation. To be

[21] Besluit DNA-onderzoeken in Verband met het Vaststellen van Uiterlijk Waarneembare Persoonskenmerken. *Staatsblad*. 2003; 201.

[22] Ibid: 1–2.

[23] Ibid: 1–2.

[24] M. Benecke. Coding or non-Coding, That is the Question. *EMBO reports* 2002; 3: 498–501. For an overview of the controversies in the US, see Ossorio, *op. cit.* note 10.

[25] Nuffield Council on Bioethics, *op. cit.*, note 6, p. 81. In addition the use of phantom sketches may jeopardize police investigation by generating too much information; see M. Innes. 2003. *Investigating Murder: Detective Work and the Police Response to Criminal Homicide*. Oxford, NY: Oxford University Press: 241–249.

[26] See especially Ossorio, *op.cit.* note 10.

[27] Tweede Kamer der Staten-Generaal (2002) Wijziging van de regeling van het DNA-onderzoek in strafzaken in verband met het vaststellen van uiterlijk waarneembare persoonskenmerken uit celmateriaal. *Jaarvergadering* 2001–2002; 28 (072, 5): 7.

sure, despite this legal 'fixing' of the biological, in genetics there is no clear-cut definition of race or of population.[28]

3. SCIENCE

In December 1949, in an effort to come to terms with race after World War II, UNESCO organized a meeting to discuss the scientific basis of the concept. What emerged was the famous UNESCO statement on race.[29] This document, written mainly by cultural anthropologists, sociologists and psychologists, concluded that there was no scientific basis for race and that it was more accurate to use the concept of population. This conclusion met fierce opposition from physical anthropologists and geneticists, however, especially with reference to inborn differences in mental capacities. Some of these actors turned the argument around and claimed that the fact that no racial differences have been found simply means that further inquiry is needed. This was the reason that UNESCO invited the contributions of 96 scientists to help produce a second document. In this one, the majority of scientists pleaded for more research instead of a hasty consensus on the (non)-existence of race. Nevertheless, and as a side effect of these debates, and the media attention they received, population became the privileged category in biological research and race was allocated to the domain of 'ideology' and 'bad science'. In the last decades, genetic diversity studies have confirmed that individuals do not fall into 'classical' racial groups. By contrast, contemporary technologies show that, depending on which part of the genome is considered, individuals can be clustered anew.[30] This development alone indicates the normative character of genetic technologies insofar as what an individual, a population or a race is made to be in a particular practice, is not given in the DNA, but is dependent on the technology applied.

By now it may not come as a surprise that race is making a vital comeback in various branches of genetic research, and in the forensic domain racial markers for traits like skin pigmentation, genetic ancestry and genealogy, hair or iris colour, are targeted for possible use in criminal investigations.[31] The forensic community itself is taking the lead in such research. For example, in the UK the Forensic Science Service (FSS) and associated researchers have determined various mutations in genes that code for red hair. In addition, FSS researchers, based at the Galton Laboratory of the University College London have been involved in a study aimed at linking facial shapes and characteristics to DNA. Gillian Tully, FSS molecular biologist, states that: 'All facial characteristics are on the agenda. [. . .] Within 10 years we might be looking at genetic tests for the basis of the main facial characteristics'.[32] Similar initiatives can be found in other countries, e.g. in the Netherlands. To be sure, most work is in an experimental phase. Yet in the brochure *Racial Identification and future application of SNPs*, the US company DNAPrint Genomics promotes a kit called DNAWITNESS 2.0 that addresses externally visible traits.

> This new test provides important Forensic Anthropological information relevant for a wide variety of investigations. When biological evidence is gathered, an investigative team can use DNA WITNESS 2.0 to construct a partial physical profile from the DNA and in many cases learn details about the donor's appearance, essentially permitting a partial reconstruction of their driver's license photo. How many times have you wished an unknown suspect left his driver's license at the scene . . . ?
>
> [. . .] DNA will effectively offer an objective 'witness' [. . .]. Other non-DNA based investigative work tend to rely on less scientifically robust methodology. For example, 'eyewitness'.[33]

The test offered by DNAPrint Genomics is rather controversial.[34] It obviously promises more than it can deliver, and for some commentators 'The current state of technology gives no indication that it is likely to develop quickly'.[35]

[28] See, e.g., D. Serre & S. Pääbo. Evidence for Gradients of Human Genetic Diversity Within and Among Continents. *Genome Research* 2004; 14: 1679–1685, 2004; Nuffield Council on Bioethics, *op. cit.* note 6; Ossorio, *op. cit.* note 10; M'charek, *op. cit.* note 3.

[29] UNESCO. 1951. *UNESCO and its Programme III: The Race Question*. Paris: UNESCO Publication 785.

[30] Ossorio, *op. cit.* note 10; Pääbo & Serre, *op. cit.* note 28; A. M'charek. 2005. *The Human Genome Diversity Project: An Ethnography of Scientific Practice*. Cambridge, Cambridge University Press.

[31] M.D Shriver et al. Skin Pigmentation: Biogeographical Ancestry and Admixture Mapping. *Human Genetics* 2003; 112: 387–399; S.J. Walsh. Recent Advances in Forensic Genetics. *Future Drug* 2004; 4: 31–40; G. Tully. Genotype versus Phenotype: Human Pigmentation. *Forensic Sci Int Genet* 2007; 1: 105–110; M. Kayser et al. Three Genome-wide Association Studies and a Linkage Analysis Identify *HERC2* as a Human Iris Color Gene. *Am J Hum Genet* 2008; 82: 1–13.

[32] Quoted in: A. Watson. A New Breed of High-tech Detectives. *Science* 2000; 289: 850–854.

[33] Ted Kessis at http://www.bioforensics.com/conference04.Racial_Identification/index.html [Accessed 28 Jan 2008].

[34] See, e.g. Ossorio, *op. cit.* note 10.

[35] Nuffield Council on Bioethics, *op. cit.* note 6, p. 87.

Thus the composition drawings that can be produced today are based on the determination of the sex of the suspect (presence or absence of the Y-chromosome) and an estimation of genealogical descent (based on statistical analysis of the Y-chromosome or the mitochondrial DNA). Peter de Knijff, a Dutch forensic geneticist and expert on genealogical descent, described the added value of genealogical/ethnic inference for criminal investigations in a Dutch documentary on visible traits and forensics:

> An important application of this technology, in my opinion, is that it helps exclude social groups that are being accused of sheltering a perpetrator of a heavy crime. For example if the rapist is deemed to be part of the Turkish population, and if you could show – based on the DNA profiles of the sperm cells found on the victim – that it is not a Turkish Y-chromosome. In such a case you can in fact alleviate the burden for *the whole Turkish population* that has been stigmatized. And I think that this is an application that the police would be happy to make use of (emphasis added).[36]

The police, in their role of overseeing and maintaining the social order, might indeed be happy with this use of technology. The gains, however, of excluding the Turkish population in a criminal investigation might be limited (i.e. in the Netherlands). For usually, and as we will see below in the still unsolved Marianne Vaatstra-case, Dutchness or whiteness does not make an informative population category for police investigation.

Interestingly enough both science and the law promise individualization:

> It must be at least theoretically possible to be able to look at someone's DNA and determine what they look like. In the next five maybe ten years I think from looking at an individual's DNA we ought to be able to tell the hair colour, the eye colour and to some extent the colour of their skin.[37]

This quote from de Knijff alerts us to a crucial feature of the inference of visible traits: although the aim seems to be to capture the visible traits of a particular suspect, the technology does not individualize. It lumps large groups of individuals together into a suspect population for whom more than privacy might suddenly be at stake. To clarify this point, I will briefly examine two murder cases, one in the Netherlands and one in Belgium. In the first case, the inference of ethnicity was based on DNA research; in the second it was based on a much more sophisticated technology for specifying visible traits, namely camera observations. The second case, in particular, will show that even if it were possible to determine the genes for specific phenotypes, putting this technology to use in criminal investigation requires the work and normative articulations of a variety of actors. The case also shows that the politico-ethics at stake goes beyond *individual* moral principles, such as privacy, inviolability of the body, or informed consent, and requires a *social* responsibility and accountability for both the technologies and the practices in which they are put to use.

4. SOCIETY

In May 1999, a young girl named Marianne Vaatstra was found dead in a meadow some kilometers away from the Frisian village of Kollum. It soon became clear that she was sexually abused and murdered. The local population was quick to suspect the inhabitants of a center for asylum seekers. Pictures and names of alleged perpetrators (inhabitants of the center) were published in different media, violating their basic right to privacy. In addition, the manner of death, cutting of the throat, was identified as a 'non-Dutch method'.[38] The suspected asylum seekers could all be acquitted based on DNA research. Yet due to the ongoing social and ethnic tensions and the lack of useful leads in the police investigation, the attorney general decided to consent with a DNA analysis of the evidence material to determine the genealogical descent of the suspect. Special consent was required because at the time the Dutch law did not allow for ethnic inference based on DNA.

Peter de Knijff, the Dutch expert on genealogical descent, was asked whether he could provide insight into the ethnicity of the suspect. The asylum seekers were from the Middle East, predominantly from Iraq. Based on genealogical analyses of the Y-chromosome de Knijff argued that the haplotype found was rare in the Middle East, but rather common in the North-West of Europe. The results were deemed unlawful by the Supreme Court and could not be brought into the criminal investigation.[39]

Although the inference of ethnicity based on DNA did not help to solve this case, since Dutchness did not help

[36] Noorderlicht. March 7 2000. Documentary Verborgen Identiteiten. (Transcript, translation by author), at http://noorderlicht.vpro.nl/afleveringen/2433157/ [Accessed 31 Jan 2008].

[37] Jackson, *op cit.* note 36.

[38] See http://www.mariannevaatstra.nl [Accessed 1 May 2008].

[39] However, despite these findings the murder and the social dismay it caused had become an impetus for xenophobia and repugnance against (alleged criminal) asylum seekers in the Netherlands. See e.g. Burgemeester Andijk dult geen racisme bij info-avond [Mayor of Andijk does not tolerate racism during information evening] *de Volkskrant*, October 29, 1999.

narrow the task of the criminal investigators, it did help to relieve the social tensions. This is not the only possible function of this technology, however. Practically speaking, DNA evidence is interesting for criminal investigators if it helps to narrow the target population, by, for instance, inferring the ethnicity of minorities. To demonstrate that the work of inferring ethnicity is not finished when the forensic scientist has spoken, especially since this technology is designed to involve the public in the criminal investigation, we will contrast the case above with a case of visible traits based on CCTV pictures.

On 12 April 2006, in the central hall of the Brussels central station, a 17-year-old boy named Joe van Holsbeeck was murdered. Two boys of about his age were interested in his mp3-player. When he was unwilling to part with it, one of them stabbed him with a knife. A number of people in the central hall saw the two suspects run away. In addition, observation cameras had registered the perpetrators in and outside the central hall. Two weeks later, the CCTV recordings, although of poor quality, were released in the media and the public was asked to help identify the suspects. Based on these recordings, the police suggested that it was looking for two young men of North African (Moroccan) descent.[40] Additional markers of difference, such as the clothing (sports wear), the movement and behaviour of the suspects, were mobilized by eyewitnesses and others to confirm their belonging to this minority.[41]

As in the case above, this murder became an object in racist and xenophobic discourses. The Belgian extreme rightwing party *Vlaams Belang* was quick to step into the debate. The parents of Joe van Holsbeeck responded immediately, however, and insisted that they did not appreciate the use of the murder of their son in political propaganda against Arabs and Muslims. But more 'mainstream' politicians also joined the chorus. In a newspaper article, a senator from the liberal party, Jean-Marie Dedecker, made the murder into a community problem by declaring that it was the result of a 'civilization deficit' among immigrants,[42] alleging a link between criminal behavior and the conservatism of a community that did not *want* to assimilate into the Belgian society. The situation became grim when, despite constant images on national television, nobody stepped forward to identify the suspects. The idea grew that 'these closed Arab communities' were protecting murderers.

When publicizing the CCTV recordings did not generate much information, the police investigators called in schoolteachers. One teacher recognized one of his pupils on the qualitatively better photographs presented to him. The next day the police arrested this 16-year-old boy of Polish descent. A few days later, the second suspect was tracked down in Poland by tracing his Mobile phone. The news that the suspects were not of Arab descent came as a shock and caused a lot of dismay in Belgian. Yet instead of reflecting on the problematic of inferring ethnic descent from pictures, the prosecutor used the fact that the suspects belonged to the Polish Roma minority to excuse the 'misreading' of the pictures.

The mp3 murder case offers an interesting analogy to the inference of visible traits on the basis of DNA. In a sense, the CCTV recordings provided the investigators with the ultimate 'silent-witness', *pictures* that showed what the suspects looked like. The information density of such pictures with regard to individual characteristics is much higher than what can be expected from DNA profiling. It is instructive therefore to see how those pictures contributed to making the suspect part of an ethnic group. Above I have argued that, with respect to visible traits, DNA evidence is normative in the sense that it does not individualize. It lumps groups together and turns them into populations of suspects. The mp3 case alerts us to another normativity of these technologies. The use of CCTV pictures showed that the work of inferring ethnicity was not finished once the results were made public. Instead, the public was invited to relate to the technology and contribute to articulations of ethnicity. What does a Moroccan look like any way? The pictures by themselves did not provide an answer. Instead, articulations emerged in a highly politicized context and linked up to specific concerns among the public. Also, the pictures mobilized a much broader racial discourse about specific minorities. Stated ideas about crime and the incentives to commit them became part of the investigative technology. Finally, the fact that revealing the identities of the suspects did not engender prejudice against the Polish community,[43] suggests that some individuals are more easily lumped into populations (or ethnic groups), whereas others can maintain their individuality.

5. ETHICS

This paper has dealt with the inference of visible traits in forensic investigations. Instead of merely evaluating

[40] For an overview of events, see the site of the Belgian broadcaster VRT: http://www.vrtnieuws.be/nieuwsnet_master/versie2/nieuws/details/060413Tienerdoodgestoken/index.shtml

[41] H. Werdmölder. 2006. Het Vertwijfelde België. *Trouw* 27 May.

[42] J-M. Dedecker. 2006. Het Failliet van een Crimineel Gedoogbeleid. *De Standaard* 19 April: 26–27.

[43] http://www.site.kifkif.be/kifkif/nieuws.php?nws_id=355&page_class=&open_menu_id [Accessed 29 January 2008].

these technologies in legal texts or in scientific accounts I have presented two cases in which such technology was applied in practice. This allowed me to make two points: one with reference to the working of this technology in practice; the second and with reference to the ethics thereof.

Above I have argued that DNA profiling technologies are normative. In the case of visible traits I have shown that this technology does not individualize. Rather it lumps groups of individuals together into a racialized suspect population.[44] But normativity holds for other forensic genetic technologies too. For example, the families produced in cases of familial searching may not map onto the family conceived of and lived by a specific person. The genetic version of a family in such a case is obviously not without politics. In addition, the genetic markers used to produce DNA profiles for the purpose of identification or ethnic inference are inherently normative in the sense that genetic diversity is built into them from the start.[45] They are chosen for forensic purposes because they show a specific amount of diversity. Also, as indicated above, genetic distance and nearness, i.e. whether a specific individual is made a member of one population or the other, is an effect not only of genetic markers but also of the statistical models applied.[46] It is in this sense that technology is not merely a neutral tool applied to nature (DNA) out there. In addition, the mp3-case – if we appreciate it as a sample case for future applications of DNA-based visible traits – adds to the complexity of this normativity. As we have seen, technology was not by itself producing categories. Rather, other socio-cultural markers of difference-making were linked to what could be seen on the CCTV-pictures in order to make them speak. These markers of difference are not merely an addition to what can be seen on the pictures (or to genetic results). Rather, the technology is dependent on them to produce adequate knowledge for criminal investigation. Hence, an articulate collective. This indicates that normativity or politics is not merely located in the technology (as a mode of technological determinism). Nor is it to be located in the context in which technology is used (contributing to a perspectivist view or a flexible interpretative approach of technology). Normativity and politics are, rather, to be located in practices where links are established between technology and society.[47] This adds to the complexity of politics, because normativity is not given in advance but performed in practices. It thus differs from practice to practice.

These shifts and changes in the normative effects of technology have consequences for the ethical questions raised. Current ethical paradigms, strongly relying on the work of Hans Jonas, tend to focus on a-priori assessments of technology and are concerned to unravel its unexpected consequences for society. Little consideration is given to the practices and social settings in which technology is put to use. In these approaches, ethics is technology-centred and context-blind. This take on ethics also suggests that ethical concerns are the same everywhere, irrespective of the practice in which technology is used.

By contrast, the cases presented above indicate that ethics is neither in one place, nor can be settled *a priori*.[48] For example, whereas ethnic inference in the first case has contributed to the exoneration of an ethnic minority, in the second a group of over 200.000 people were stigmatized. The ethical values at stake went beyond the usual values addressed when evaluating forensic technology, such as the inviolability of the body, the privacy of concrete suspects, or their equal treatment. Instead the broader effect of technology might endanger the privacy, autonomy and equal treatment of a whole population and contribute to their stigmatization and criminalization.

Does this mean that this stigmatization or racial discrimination should be dealt with in general by policymakers, e.g. by designing a new law? This type of problem is not easily solved in a legalistic manner. For in practice it might mean that a group of youngsters does not dare to occupy public spaces because of resentments towards the population to which they allegedly belong. Or it might mean the burden felt and insults experienced by pupils at school, who are collectively made responsible for a crime they did not commit.[49]

Such politico-ethical problems cannot merely be settled as a precautionary measure but should rather be a matter of ongoing concern for the actors involved whenever this technology is put to use. The recently published report of the Nuffield Council on Bioethics opens up possibilities for such a broader take on ethics.[50] It articulates the need for oversight and governance, yet, in its elaboration of this need, it still tends to link ethical concerns to the technology proper (e.g. the DNA databank). What we

[44] S. Cole & M. Lynch. The Social Creation of Suspects. *Annu Rev Law Soc Sci* 2006; 2: 39–60.

[45] M'charek, *op. cit.* note 30.

[46] Serre & Pääbo, *op. cit.* note 28.

[47] For this take on politics, see Mol, *op. cit.* note 12; J. Law & A. Mol. Globalisation in Practice: On the Politics of Boiling Pigswill. *Geoforum* 2006; 39: 133–143.

[48] My claim is not that forensic DNA is unique in this respect. Its analysis rather provides an example of how investigations of the ethics of technologies can be carried out in practice.

[49] See e.g. Kifkif website, *op. cit.* note 44.

[50] Nuffield Council on Bioethics, *op. cit.* note 6.

learn from the cases presented here is that if we want to evaluate the broad range of ethical implications, technologies should be assessed in practice. Given their dependency on practices to make them speak, I have suggested viewing technologies as articulate collectives. With this approach the politico-ethical questions raised are neither external to, nor contained in technologies. Such questions are rather part and parcel of the practices in which technologies are put to use.

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