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I-DNA-FICATION, PERSONAL PRIVACY, AND SOCIAL JUSTICE

ERIC T. JUENGST, PH.D.*

INTRODUCTION

On March 1, 1999, U.S. Attorney General Janet Reno asked the National Commission on the Future of DNA Evidence to assess the legality of collecting DNA samples from everyone arrested by the police, and of banking the individually identifying genetic information they contain for future law enforcement use. This request came on the heels of the inauguration in October 1998 of the FBI's national electronic database of "DNA fingerprints" taken from convicted criminals by forensic laboratories in all fifty states.[1] That initiative, in turn, had been underway ever since the value of DNA profiles as uniquely identifying personal traits was first demonstrated in 1985.[2] In the interim, the collection of DNA for personal identification purposes has already become mandatory within the military,[3] and has become a mainstay of civilian efforts to clarify the identities of children,[4] kidnap victims,[5] family lineages[6] and even religious relics.[7] On the horizon lies the question that civil libertarians anticipate with dread: why not store personally identifying genetic information on everyone as a matter of course, for the advances in public safety and

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1. *See* Russ Hoyle, *The FBI's National DNA Database*, 16 NATURE BIOTECHNOLOGY 987, 987 (1998).

2. *See* A.J. Jeffreys et al., *Individual-Specific "Fingerprints" of Human DNA*, 316 NATURE 76, 76 (1985).

3. *See* Robert Craig Sherer, Note, *Mandatory Genetic Dogtags and the Fourth Amendment: The Need for a New Post-Skinner Test*, 85 GEO. L.J. 2007, 2010-11 (1997).

4. *Cf.* CONGRESS OF THE U.S., OFFICE OF TECHNOLOGY ASSESSMENT, GENETIC WITNESS: FORENSIC USES OF DNA TESTS (1990).

5. *Cf.* ERIC STOVER & GILLES PERESS, THE GRAVES: SREBRENICA AND VUKOVAR (1998).

6. *See* Don Terry, *DNA Results Confirmed Old News About Jefferson, Blacks Say*, N.Y.TIMES, Nov. 10, 1998, at A18, A18.

7. *Cf.* GILBERT R. LAVOIE, UNLOCKING THE SECRETS OF THE SHROUD (1998).

personal security that can be gained thereby?

Photographs and traditional fingerprints have, of course, also been taken, collected, and used for all these same purposes in the past. But unlike photography and manual fingerprinting,[8] collecting individually identifying DNA patterns ("IDNAfication" for short) does involve taking bits of people's bodies from them: nucleated cells and their complements of DNA molecules. For those concerned about the ethical and legal status of our body tissues and our ability to control what happens to us through them, this corporeal side of iDNAfication raises an interesting challenge. Clearly, questions of personal privacy are involved. But unlike most other disputes over body tissues, the issues here are not primarily matters of personal sovereignty.

For example, unlike involuntary sterilization or forced surgeries, the central concern with mandatory iDNAfication does not seem to be the violation of a person's bodily integrity. Compared with the other infringements of personal freedom that legitimately accompany legal arrest, providing a saliva or cheek swab sample seems negligibly invasive.[9] Moreover, unlike the creation of marketable human cell lines or the commercialization of organ procurement, it is not the exploitation or misappropriation of the person's body for others' gain that is centrally troubling either. Manual fingerprints and photographs also exploit suspects' bodies in order to incriminate them without raising special privacy concerns.[10] Moreover, consider the fact that it does not matter to an identical twin whether a DNA sample under scrutiny actually comes from him or his sibling; to the extent that the genetic information it contains describes both their bodies, the privacy of each is endangered.

In fact, the major moral concern about iDNAfication has little to do with whether the DNA analyzed is "a piece of" the person being identified, "the property of" the person being identified, or even is "forcibly extracted from" the person being identified. In most

8. What does one call traditional fingerprinting to distinguish it from DNA typing? "Digital fingerprinting" is confusing, since the DNA profiles themselves are "digitized" representations of DNA marker patterns. "Phalangeal fingerprinting" sounds redundant. I will use "manual fingerprinting," because it both takes impression from hands and still must be done by hand.

9. *Cf.* Marjorie Maguire Shultz, *Reasons for Doubt: Legal Issues in the Use of DNA Identification Techniques*, *in* DNA ON TRIAL: GENETIC IDENTIFICATION AND CRIMINAL JUSTICE 19 (Paul R. Billings ed., 1992).

10. *Cf.* Schmerber v. California, 384 U.S. 757, 764 (1966) (distinguishing between self-incriminating testimony and physical evidence).

iDNAfication contexts, these "physical," "proprietary," and "decisional" privacy considerations are beside the point.[11] Rather, the important feature of iDNAfication is what the DNA analyzed can *disclose about* the person being identified. It is, in other words, individuals' "informational privacy" that is at stake in the prospect of widespread iDNAfication, and it is in those terms that the policy challenge of iDNAfication should be framed. What should society be allowed to learn about its citizens in the course of attempting to identify them?

Taking up this challenge does mean taking seriously the precedents set by society's use of photography and manual fingerprinting, since their primary impact on personal privacy also lies in the identifying information they record rather than the nature of their acquisition. If the collection of mandatory "mug shots" and fingerprint impressions are taken as benchmarks of social acceptance for at least some identification purposes, any iDNAfication methods that conveyed no more personal information than those techniques should also be socially acceptable for at least the same range of purposes. Thus, where we now legitimately take fingerprints of arrestees, inmates, employees and recruits, we should be justified in performing iDNAfication if its informational privacy risks were equivalent. Similarly, if we accept the personal disclosures involved in using photographs on drivers' licenses and identification cards, we should be willing, in theory, to expose an equivalent range of genetic information in any legitimate forms of iDNAfication. One approach to the general challenge of iDNAfication, then, would be to ask the following question: if we accept the ways in which photographs and manual fingerprints are used for legitimate identification purposes today, under what circumstances, if any, might forms of iDNAfication meet the standard those practices set for the disclosure of personal information?

My goal in this essay is to review the privacy issues surrounding iDNAfication in terms of this focal policy question. In the next section, I briefly reiterate two relevant points many others have made about existing iDNAfication programs: (1) to approximate the intrusiveness of traditional fingerprinting, any DNA taken for identification purposes should only be typed for information-free

11. *See* Anita L. Allen, *Genetic Privacy: Emerging Concepts and Values*, *in* GENETIC SECRETS: PROTECTING PRIVACY AND CONFIDENTIALITY IN THE GENETIC ERA 31, 33 (Mark A. Rothstein ed., 1997) (distinguishing between the four senses of privacy referred to here).

markers; and (2) no physical DNA samples should be banked. The second point is the contentious one, of course, but critical to the issue at hand. Then, in the following section, I raise what seem to me to be the primary social policy considerations that could distinguish iDNAfication from other techniques: our society's commitment to equality of opportunity in the face of the persistence of racism, on one hand, and our commitment to a presumption of innocence for the targets of criminal investigation, on the other. As I try to show, both commitments could be endangered by widespread use of iDNAfication unless two rules can be enforced: (1) identifying DNA profiles should be accessible to criminal investigations only for those individuals already convicted of crimes, and (2) no markers conferring differential advantages by "race" should be tolerated. In the last section, I summarize my analysis by making nine recommendations for general iDNAfication principles. These recommendations might provide the basis for our social response to invitations, like Attorney General Reno's, to consider the widespread use of iDNAfication technologies for the larger social good.

I. PERSONAL PRIVACY CONSIDERATIONS

Most of the personal privacy risks of iDNAfication have already been described by others and anticipated in the design of some iDNAfication programs. For example, many have pointed out that, if the DNA sequences used as the components of iDNAfication profile are taken from the regions of the human genome that code for proteins, important biological information about their sources could be revealed, including information about their paternity, current health status, and potential health risks.[12] Any risk of disclosing sensitive personal information of these sorts would clearly increase the intrusiveness of iDNAfication beyond that of traditional fingerprinting and photography. In addition, it could expose the person being described to the possibility of being discriminated against on the basis of a disclosed genotype.[13] Fortunately, this is a

12. *Cf.* CONGRESS OF THE U.S., OFFICE OF TECHNOLOGY ASSESSMENT, *supra* note 4, at 98-101 (discussing the use, advantages, criticisms and limitations of using DNA evidence in criminal investigations and civil paternity cases). *See generally* COMMITTEE ON DNA TECH. IN FORENSIC SCIENCE ET AL., DNA TECHNOLOGY IN FORENSIC SCIENCE (1992) (discussing the collection and use of DNA profiles in the legal system).

13. *See, e.g.*, Philip L. Bereano, *DNA Identification Systems: Social Policy and Civil Liberties Concerns*, 1 INT'L J. BIOETHICS 146, 151 (1990) (discussing "genetic redlining," defined as discrimination based on genetic screening); Andrea de Gorgey, *The Advent of DNA Databanks: Implications for Information Privacy*, 16 AM. J.L. & MED. 381, 396 (1990). *Cf.*

privacy risk that can be almost entirely eliminated by two simple precautions: (1) avoid analyzing biologically informative DNA, and (2) destroy the DNA samples upon analysis.

The first precaution can be accomplished by restricting the sections of DNA that are amplified, analyzed and utilized in the iDNAfication profile to the noncoding regions of DNA between our functional genes. By definition, markers selected from these regions will not disclose any biologically significant information. Rather, like fingerprints, they could merely provide a unique pattern to match in seeking to identify an unknown person. Even photographs are useful mainly as patterns to match, rather than for what they can independently tell us about the person pictured in them. Serendipitously, individual variation is also vastly more pronounced in this so-called "junk" DNA (since mutations can accumulate in these sections without having any adverse effect on genomic function), making it more attractive for iDNAfication purposes on scientific ground as well.

Thus, the Federal Bureau of Investigation (the "FBI"), in establishing standardized forensic iDNAfication markers for use by state laboratories contributing DNA profiles to the Bureau's National DNA Index System, has focused on a set of thirteen loci from noncoding regions that contain series of repeated nucleotide sequences whose length is highly variable between individuals: either "variable number of tandem repeat" sites or "short tandem repeats" sites, depending on the analytic method used.[14] The exclusive use of these markers in any iDNAfication program would forestall most genetic privacy concerns linked to the biological information content of DNA profile itself. Since other marker systems that do involve coding regions from both nuclear and mitochondrial DNA have been used for forensic iDNAfication purposes in the past,[15] and, as I will

American Soc'y of Human Genetics, Ad Hoc Comm. on Individual Identification by DNA Analysis, *Individual Identification by DNA Analysis: Points to Consider*, 46 AM. J. HUM. GENETICS 631 (1990) (stressing the importance of confidentiality in DNA databanks); Barry Scheck, *DNA Data Banking: A Cautionary Tale*, 54 AM. J. HUM. GENETICS 931, 932-33 (1994) (discussing the potential for controversial use of DNA databanks such as for research studies on the genetic makeup of certain kinds of criminal offenders).

14. *See* Hoyle, *supra* note 1, at 987 (stating that "DNA law also sharply limits DNA identification technology to 13 basic probes that can isolate genetic characteristics, but are unable to provide fuller details of identity").

15. *Cf.* Randall S. Murch & Bruce Budowle, *Are Developments in Forensic Applications of DNA Technology Consistent with Privacy Protections?*, *in* GENETIC SECRETS: PROTECTING PRIVACY AND CONFIDENTIALITY IN THE GENETIC ERA 212, 224 (Mark A. Rothstein ed., 1997) (acknowledging use of coding region markers for forensic analysis).

suggest below, others may become very attractive to law enforcement officials in the future, *one important prerequisite to meeting the existing "pattern matching" standard would be to strictly limit the DNA profiles generated by any iDNAfication program to uninformative noncoding regions.*

The second important step to insuring the genetic privacy of iDNAfication is to destroy the physical samples of DNA once DNA profiles have been generated from them. As long as the DNA samples themselves are retained, the risk remains that they could be retested for their biological informational content. Thus, in its report on forensic DNA analysis, the National Academy of Sciences in 1990 recommended that even samples taken from convicted offenders be destroyed "promptly" upon analysis,[16] and the FBI has designed its national iDNAfication collection as a databank, not a DNA bank, including only the electronic profiles of noncoding DNA markers.[17]

Unfortunately, this second precaution has not been adopted by forensic laboratories at the state level or by the military at the federal level. Most of these laboratories continue to plan to bank their actual DNA samples indefinitely, on the grounds that the samples may need to be retested as new markers or testing technologies become standard.[18] The U.S. Department of Defense is storing dried blood samples from its recruits for genotyping only in the event that the recruits later turn up missing in combat. This effectively undercuts the privacy protections afforded by using noncoding markers in the iDNAfication profile itself and immediately elevates the privacy risk of any iDNAfication program well beyond that of ordinary fingerprinting. Even if, *contra* the National Academy of Sciences, this increased risk were tolerable for convicted offenders, it should not be for military recruits, government employees, or arrestees, since the potential intrusion goes well beyond what is required for identification.

This suggests another important prerequisite for any wider uses of iDNAfication. *In order to be acceptable, any proposal for iDNAfication should include the requirement for immediate post-typing sample destruction.* In effect, the price of adding new markers to the typing repertoire may be the need to re-sample the available

16. COMMITTEE ON DNA TECH. IN FORENSIC SCIENCES ET AL., *supra* note 12, at 122.

17. *See* Murch & Budowle, *supra* note 15, at 226-27 (describing the FBI's National DNA Index System).

18. *See* Jean McEwen, *Forensic DNA Data Banking by State Crime Laboratories*, 56 AM. J. HUM. GENETICS 1487, 1490-91 (1995).

eligible population—a hurdle that may also serve as a useful brake on any undue proliferation of markers and provide a periodic occasion for taking stock of the collections.

II. SOCIAL POLICY CONSIDERATIONS

Despite the initial hopes of early enthusiasts like Francis Galton, large collections of ordinary fingerprints have never been useful for much else besides individual identification.[19] As a result, little debate exists over the risks or benefits of "versatility" as a feature of ordinary fingerprint collections. The informational potential of the human genome, however, does require the designers of iDNAfication systems to consider in advance the range of uses they should accommodate. Even when a DNA profile collection is committed exclusively to use for "personal identification purposes," several policy choices present themselves. (1) Should the system be designed to support any type of research involving the stored information? (2) Should the system be designed to aid in the identification of the sources of new DNA samples without clear matches in the database? (3) Should the system be designed to support electronic "dragnet" screening of the population in search of particular individuals? In the context of the expanding uses of iDNAfication, these choices raise some important social policy issues that go well beyond issues of personal privacy.

A. Research Uses

Among the legislatively authorized uses of the existing iDNAfication databanks are their use for various kinds of research. For example, many state statutes, following the FBI's legislative guidelines, provide for the use of convicted offender iDNAfication data in research by state forensic scientists designed to improve iDNAfication techniques and protocols.[20] Although the state statutes vary widely in the security procedures they mandate for containing this research within the crime laboratories and protecting the identities of the sample sources, implementing the protections

19. Francis Galton hoped that the analysis of fingerprints would reveal the behavioral predispositions, personality types, or, at the very least, the ethnic and racial identities of those who left them. *See* Paul Rabinow, *Galton's Regret: Of Types and Individuals*, *in* DNA ON TRIAL: GENETIC IDENTIFICATION AND CRIMINAL JUSTICE 5, 7 (Paul R. Billings ed., 1992).

20. *See, e.g.*, ALA. CODE § 36-18-3 (1994).

recommended by the FBI[21] would raise few direct privacy issues.

However, it is worth noting that to the extent that this research requires access to physical DNA samples, it provides the main impetus for retaining samples in state crime labs after the database profiles have been generated. Moreover, to the extent that this research is successful, it will be the main source of new typing markers and techniques, and an engine of change within an iDNAfication system. In that light, it may be worth recommending that, just as we do in medical genetics, the research engine be revved, monitored and tuned "out of gear" in experimental settings before being engaged and applied to practice. In this case, for instance, that might mean establishing a research collection of DNA samples separately from the iDNAfication collection based on voluntary contributions from informed sources in the normal manner of biomedical genotyping research. This would both enhance the legitimacy of the research enterprise and allow the iDNAfication collection to enjoy the protection of destroying its samples after typing them.

Of course, far from adopting biomedical standards for forensic research, some states already go too far in the other direction by allowing biomedical research to be conducted as if it were forensic work. For example, Alabama allows the use of anonymous DNA samples from its convicted offender collection "[t]o provide data relative to the causation, detection and prevention of disease or disability" and "[t]o assist in other humanitarian endeavors including, but, not limited to, educational research or medical research or development."[22] First of all, again, this provision clearly assumes that Alabama will be banking physical DNA samples, which is problematic in itself, as I've suggested above. Secondly, Alabama's generosity towards researchers is presumably premised on the view that the "anonymity" of the samples provides adequate protection of the sources' privacy, and frees the state from having to worry about the usual elements of biomedical research like informed consent. But on the contrary, from the perspective of research ethics, these samples are not anonymous, or even "anonymized," since the iDNAfication database is itself the key to identifying the source of any given sample. Since that existing linkage makes it technically

21. *See* Murch & Budowle, *supra* note 15, at 219-22 (describing security precautions for forensic DNA collections).

22. ALA. CODE § 36-18-3.

possible to benefit and harm the sample donors with the results of such research, all the usual biomedical research protections should apply.[23] Moreover, if access to the database is opened as widely as the range of research authorized in Alabama suggests, there is another risk from which sample anonymity offers no protection: the risk of being discovered to be a convicted criminal by any "researcher" who already knows your genetic identity and finds you in the database.[24]

In addition to these personal privacy issues, moreover, open-ended research on iDNAfication samples also poses broader questions of research justice. Collections of DNA samples from criminals or soldiers, for example, are likely to be perceived as particularly rich research resources by those interested in studying genetic factors involved in anti-social or aggressive behavior. Unfortunately, our social experience with such research has not been good.[25] Repeatedly, such studies have succumbed to ascertainment biases that ultimately mischaracterize—and stigmatize—groups of people that are disproportionately represented in the systems under study for social reasons.[26]

Two forms of injustice tend to flow from these results.[27] First, genetic claims about individual research subjects, like those concerning "XYY syndrome" in the 1970s, become generalized to an entire class, simultaneously pathologizing behavior and stigmatizing

23. *See* American Soc'y of Human Genetics, *ASHG Report: Statement on Informed Consent for Genetic Research*, 59 AM. J. HUM. GENETICS 471, 471 (1996); *see also* American College of Med. Genetics Storage of Genetic Materials Comm., *ACMG Statement: Statement on Storage and Use of Genetic Materials*, 57 AM. J. HUM. GENETICS 1499, 1499 (1995) (containing recommendations on what a patient should be informed about when providing DNA samples); Ellen Wright Clayton et. al., *Informed Consent for Genetic Research on Stored Tissue Samples*, 274 JAMA 1786, 1786 (1995) (containing "recommendations for securing appropriate informed consent when collecting tissue samples for possible use in genetic research and for defining indications for additional consent if samples in hand are to be used for genetic studies"); Robert F. Weir & Jay R. Horton, *DNA Banking and Informed Consent—Part 2*, IRB: A REVIEW OF HUMAN SUBJECTS RES., Sept.-Dec., 1995, at 1, 1 (analyzing and comparing the content of various consent documents used for DNA banking).

24. Imagine a clever employer, like a University Department of Forensic Science, who is concerned about promoting anyone with a criminal conviction. If the candidates' DNA profiles can be voluntarily acquired ("a student project"), and an adequate "research" proposal concocted, the Department could scan the state database in search of its promotion candidates—something it could not do (legally) with the state's criminal fingerprint files.

25. *See generally* BIOLOGY, CRIME AND ETHICS: A STUDY OF BIOLOGICAL EXPLANATIONS FOR CRIMINAL BEHAVIOR (Frank H. Marsh & Janet Katz eds., 1985).

26. *See* TROY DUSTER, BACKDOOR TO EUGENICS 96-109 (1990) (discussing the biases of ascertainment in criminality studies).

27. *See* David Wasserman, *Science and Social Harm: Genetic Research into Crime and Violence*, 15 REP. FROM INST. FOR PHIL. & PUB. POL'Y 14, 15-16 (1995).

bearers of the genetic trait.[28] This has the effect of both undercutting personal responsibility[29] and legitimizing draconian "medical" responses to the targeted behavior, like eugenic sterilization.[30] Second, like the old eugenic studies[31] and the new MAOA studies,[32] genetic studies tend to misdirect attention from the overwhelming social causes of the behaviors they purport to explain by encouraging a determinism that suggests that efforts at social reform are ultimately futile. Where this misdirection reinforces existing social policy inequities, it is likely to have an even more pronounced effect.[33]

Of course, this problem should not come up in practice; to meet the "pattern matching" standard, all research that requires examining any actual genes should have already been ruled out for iDNAfication programs by the privacy protections described above. Indeed, I raise this issue mainly to illustrate a point—that the generation of genetic information, even anonymized and aggregated genetic information, can carry collective risks for groups that can settle on the shoulders of their individual members to their detriment. If one goal of social justice is to prevent mere group membership from imposing undeserved social burdens on individuals, the collective impact of any new generator of genetic information should be part of its risk assessment.

Finally, almost all states also allow their convicted offender iDNAfication databases to be used anonymously for the generation of population polymorphism frequency statistics.[34] These statistics are used as the background against which the significance of any

28. *See* A. Freyne & A. O'Connor, *XYY Genotype and Crime: 2 Cases*, 32 MED. SCI. & L. 261, 261-62 (1992).

29. *See generally* Maureen P. Coffey, Note, *The Genetic Defense: Excuse or Explanation?*, 35 WM. & MARY L. REV. 353, 353-99 (1993) (examining criminal responsibility in light of scientific data in the area of genetics).

30. *See generally* PHILIP R. REILLY, THE SURGICAL SOLUTION: A HISTORY OF INVOLUNTARY STERILIZATION IN THE UNITED STATES (1991) (discussing the heritability of sexual deviance, eugenics and critic of involuntary sterilization).

31. *See generally* J. DAVID SMITH, THE EUGENIC ASSAULT ON AMERICA (1993) (discussing eugenics and race).

32. *See* Charles Mann, *Behavioral Genetics in Transition*, 264 SCIENCE 1686, 1688-89 (1994) (discussing a study on monoamine oxidase A (MAOA) from which some researchers inferred the existence of a relation between the gene that codes for the activity of MAOA and aggressive behavior and the implications of the study).

33. *See generally* Rochelle Cooper Dreyfuss & Dorothy Nelkin, *The Jurisprudence of Genetics*, 45 VAND. L. REV. 313 (1992) (exploring the relation between "biological assumptions," the "concept of personhood" and notions of law and justice).

34. *See generally* Jean E. McEwen & Philip R. Reilly, *A Review of State Legislation on DNA Forensic Data Banking*, 54 AM. J. HUM. GENETICS 941 (1994) (documenting statutes allowing research access to anonymized data).

particular database match is measured. In the initial (British) DNA fingerprinting studies, they were calculated for the general population as a whole, a strategy that assumed that the different variants of the multiple markers used were randomly distributed throughout the population.[35] Critics of this strategy argued that the U.S. population, at least, is significantly segregated into multiple, largely endogamous sub-populations and that lumping them together for analysis would have the effect of artificially exaggerating the statistical uniqueness of any particular profile by diluting the relative frequency of that profile in the subpopulation with its relative rarity in other subpopulations.[36] To account for the lack of random mating in our population, the critics argued that detailed genetic variation studies of the population along ethnic and geographical lines were required.[37] Others argued, however, that the statistical benefits of attempting to extensively subdivide the population are minimal for forensic purposes, and are quickly outweighed by the logistical and conceptual problems involved.[38] Instead, the FBI now uses a simplified scheme of "readily apparent" population reference groups, consisting of "major population groups" like "African Americans" and "Caucasians" and "geopolitical groups" like "Hispanics."[39]

Of course, it is obvious that these reference groups correspond to the same traditional and problematic racial categories that have been so often misused in our society in the past and underlie so much of this country's efforts to achieve and ensure equality of opportunity for its citizens. Should the continued use of these categories as reference groups for iDNAfication population frequency data be a cause for concern?

In responding to their critics, defenders of the FBI's use of racial categories as genetic reference groups make an argument that is helpful to appreciate. They point out that further ethnic specification is impractical in law enforcement contexts because ethnicity is not

35. *See generally* Jeffreys et al., *supra* note 2 (discussing the initial British DNA studies).

36. *See generally* Joel E. Cohen, *DNA Fingerprinting for Forensic Identification: Potential Effects on Data Interpretation of Subpopulation Heterogeneity and Band Number Variability*, 46 AM. J. HUM. GENETICS 358 (1990).

37. *See* R.C. Lewontin & Daniel L. Hartl, *Population Genetics in Forensic DNA Typing*, 254 SCIENCE 1745, 1745 (1991).

38. *See* Bruce Budowle et al., *Reliability of Statistical Estimates in Forensic DNA Typing*, *in* DNA ON TRIAL: GENETIC IDENTIFICATION AND CRIMINAL JUSTICE 79, 80 (Paul R. Billings ed.. 1992); *see also* Ranajit Chakraborty & Kenneth K. Kidd, *The Utility of DNA Typing in Forensic Work*, 254 SCIENCE 1735, 1738-39 (1991).

39. *See* Murch & Budowle, *supra* note 15, at 219.

always readily apparent and becomes dependent too quickly on the suspect's self-description to be reliable. Moreover, they argue, the statistical differences that ethnic specification would yield, while meaningful to a population historian or genetic epidemiologist, are insignificant in the courtroom setting. To suggest that they were significant, in fact, might produce an unhealthy biological segregation of ethnic populations that could promote inter-group discrimination.[40]

On the other hand, the argument goes, it is empirically demonstrable that most Americans do marry within their socially-identified "race," so that more endogamy and thus greater allele frequency variation can be expected among groups defined in those terms. From this perspective, using racial categories as reference classes, and sorting profiles into those racial categories in the process of building population statistic databases is not to attribute any special biological reality to race; it merely reflects the influence of *racism* on our country's current population marriage patterns.

In any case, they conclude, even the major reference classes are of little forensic significance due to the extensive overlap between them. In the end, the FBI advocates assessing any given match against all the reference groups, and letting the triers of fact—juries and judges—decide which is most relevant to use in a given case.[41]

This is a persuasive argument, but perhaps it proves too much; in the end it cuts against their own position as well as their critics'. For example, consider their concern about the ambiguity of "ethnicity," and the risk of discrepancies between a suspect's self-identified social ethnicity and his genetic ancestry. In fact, despite the rigidity of the social boundaries we create with racial designations, both social scientific research[42] and population genetic research[43] suggest that these groups are much less endogamous—much less group-like, from the genetic perspective—than we generally acknowledge. It may be possible to isolate some polymorphisms that, in today's population, are more frequently found in one socially defined group than in another. But they will also always be linked to others that span the

40. *See generally* Eric T. Juengst, *Group Identity and Human Diversity: Keeping Biology Straight from Culture*, 63 AM. J. HUM. GENETICS 673 (1998) (discussing the implications of studies into the genetic differences of human groups).

41. *See* Budowle et al., *supra* note 38, at 88.

42. *See generally, e.g.*, VIRGINIA R. DOMINGUEZ, WHITE BY DEFINITION (1986) (discussing the social construction of personal racial identities).

43. *See, e.g.*, JONATHAN MARKS, HUMAN BIODIVERSITY: GENES, RACES, AND HISTORY 273-75 (1995).

groups, and their frequencies will change within the fluctuating social boundaries of the groups from one generation to the next. Moreover, if the statistical differences between these groups are insignificant enough to make selecting the appropriate reference group a social judgment call rather than a matter of science, are they differences that we should let make a difference? After all, in most contexts we do decry, as part of the injustice of racism, the use of social criteria like the "One Drop Rule" to assign people to racial categories that work to their disadvantage.[44] Perhaps as a corrective to that risk, the choice of relevant reference group should be left open not to the triers of fact, but to the sample donors themselves, to give them the opportunity to use the group that works best to their advantage.

On the other hand, in other forums, such as insurance underwriting, we have made policy decisions to blind the "triers of fact" (actuaries in this case) to statistical differences in mortality and morbidity between socially defined racial groups, even where those differences are actuarially significant. As a matter of justice, we resist being saddled with the burden of generalizations about groups to which we just happen to (involuntarily) belong. By the same token, even where the polymorphism frequencies between "races" are statistically significant, it seems like a form of discrimination to let those generalized differences influence the outcome of particular cases. Given what we know about the plasticity of "race" and the dangers of perpetuating it as a social discriminator, neither the advantages nor the disadvantages that its use can afford in the courtroom, the university admissions office or the personnel department seem justified.

On these social justice grounds, then, we should be careful to develop iDNAfication tools only in the context of background polymorphism frequency data that are not organized against socially defined racial categories. The price of this recommendation would be the loss of some degrees of statistical resolution in assessing match significance; but it will be a loss across the racial board. Moreover, if less subpopulation sensitive markers can be developed and used, it may not be a loss that will make that much practical difference to the "triers of fact."

44. *See generally* DOMINGUEZ, *supra* note 42 (on the history of the "one drop rule" for determining "Negro" racial status).

B. Profiling Uses

The third kind of databank that is part of a comprehensive iDNAfication system (in addition to the identified DNA profile collection and the aggregate population polymorphism frequencies database) is an open case file: a collection of DNA profiles taken from crime scenes or battlefields or plane crash sites that come from as yet unidentified sources. Obviously, this collection needs to be comparable to the identified reference collection, which means the same markers should be used to compose the profiles in both. With these collections, however, investigators will be especially pulled to glean as much information as they can from their genetic analyses in their efforts to compose a profile of their missing sample source.

One of the areas of highest interest has been in noncoding polymorphisms that would allow investigators to estimate the "ethnic affiliation" of a sample source. A recent article captures the spirit of this effort, and some of its internal tensions, in its conclusion:

> Although ethnic affiliation is often clearly evident on gross observation, many of the traits that allow these distinctions are superficial. Ethnic classification is much more difficult when one has only skeletal remains or a sample of blood to examine. This is primarily due to the facts that human populations share a very recent common ancestry and that the majority of the total genetic variation is due to differences within populations and not to differences between them.... Additionally, the large-scale hybridization or admixture of populations that has occurred in the United States has acted to obscure the genetic differences among resident populations. Despite these factors, we have shown that it is possible to identify a collection of genetic markers that are distinctive enough to allow confident genetic EAE [ethnic affiliation estimations].... In addition, it may prove feasible to estimate individual admixture concurrent with EAE, so that interethnic individuals, first- or second- generation hybrids of one or more populations, could be identified and classified appropriately.[45]

These investigators call their markers "population specific alleles" or "PSAs," and the ethnic populations they mark are, once again, just our traditional "races:" "European-Americans," "African-Americans," "native Americans," and "Asian Americans."

Should these PSAs be included in or excluded from the panel of markers established for our universal, "humanitarian" iDNAfication

45. Mark D. Shriver et al., *Ethnic-Affiliation Estimation by Use of Population-Specific DNA Markers*, 60 AM. J. HUM. GENETICS 957, 962-63 (1997).

system? Including them would allow the system to support an open case file that could take advantage of the additional information to narrow the search for sample sources. It would also, presumably, take the guesswork out of deciding against which racial reference group to assess a particular sample.

Of course, including PSAs in iDNAfication profiles would elevate the informational content of the profile beyond that of a traditional fingerprint, constituting more of an intrusion on privacy. Moreover, it would do so by reporting a particularly socially sensitive feature of the arrestee: his probable race. But "mug shot" photographs also can reveal race, and we sanction collecting them for identification purposes. How would this be different?

Photography is an illuminating analogy here. Photographs show only the superficial distinctions that we use socially to categorize a person's ethnic affiliation. They leave that categorization itself up to the "gross observer," and make no claims about its merits. Thanks to our "large-scale hybridization," in other words, passing for one race or another is still possible in mug shots. PSAs, on the other hand, are defined in terms of our society's racial categories, and purport to be able to "appropriately classify" even interethnic individuals into their true (ancestral) categories.

This has several implications. First, it does mean that genuine secrets might be revealed through PSA screening. For example, shifts in the social ("racial") status of the arrestee or her ancestors that have nothing to do with her arrest, but which, if interpreted as normative, could cause psychological and social harm to the individual and her families by upsetting her social identity. In that sense, PSAs are more threatening to privacy than photographs. Second, as the author's own hopes for "appropriately classifying" hybrids shows, it is hard not to make the logical mistake of moving from the use of social categories to define the PSAs to then using PSAs to define our social categories. This mistake is a dangerous one from a social policy perspective, however, for two reasons.

First, it risks exacerbating racism by reinventing in statistical and molecular terms the arbitrary social apparatus of the "blood quantum" and the "One Drop Rule." Under PSA screening, one's proportional racial endowment could be quantified, and carrying the defining polymorphisms for any given race would warrant (statistically) affiliating one with it for official identification purposes regardless of one's superficial social identity. In the wake of a

program of iDNAfication in which thousands of Americans would have their PSAs determined, this could have powerful social consequences. For example, consider this January 1996 news flash from the PSA research world:

> An extremely rare mutation on the Y chromosome may be a genetic marker that is unique to the people who first migrated to the Americas some 30,000 years ago, researchers report. A group of Stanford University researchers have identified a mutation that in their sample [of "500 DNA samples from populations around the world"] exists only in Indian populations in North and South America and in Eskimo groups.... [T]he Y chromosome mutation occurred in a stretch of DNA that is not related to a gene, but is part of "junk" DNA that separates the genes.[46]

Would it be tolerable to allow this PSA to be used as a sufficient condition for membership in Native American groups? Would it be fair for an American man to use a positive test for this PSA in supporting a claim to affirmative action benefits?[47] Anthropologists already report that "[i]ronically, in trying to protect their political sovereignty, some U.S. Indian groups have seized upon the notion of blood quantum as a way of defining citizenship and protecting their sovereignty."[48] Conversely, to the extent that anti-indigenous prejudice still animates the policies of some countries in this hemisphere, might a detectable genetic hallmark like this PSA serve as an indelible (if statistical) "yellow star," marking those with indigenous American ancestry for oppression? The capacity for both inclusive and exclusive uses of this "ethnic affiliation" marker already exists in forensic genotyping labs throughout our hemisphere.

In fact, our bad experiences with other forms of "low tech" racial profiling in law enforcement[49] have already lead to debates in the courts on whether these practices are unconstitutional under the Equal Protection Clause.[50] If PSAs were used forensically to limit investigations to suspects of a single social "race," they would be vulnerable on the same grounds.

46. Paul Recer, *Genetic Marker of First Migrants*, CLEV. PLAIN DEALER, Jan. 14, 1996, at 5-F, 5-F.

47. *See generally* Arthur L. Caplan, *Handle with Care: Race, Class and Genetics*, *in* JUSTICE AND THE HUMAN GENOME PROJECT 30 (Timothy F. Murphy & Marc A. Lappé eds., 1994) (discussing the relationship between genetic discoveries and social policies).

48. John H. Moore, *Native Americans, Scientists, and the HGDP*, CULTURAL SURVIVAL, Summer 1996, at 60, 62.

49. *See generally, e.g.*, Erika L. Johnson, *"A Menace to Society:" The Use of Criminal Profiles and Its Effects on Black Males*, 38 HOW. L.J. 629, 629-64 (1995) (examining the use of criminal profiles and its discriminatory impact and legal implications).

50. *See, e.g.*, United States v. Lopez, 328 F. Supp. 1077, 1081 (E.D.N.Y. 1971).

The second danger in estimating ethnic affiliation through PSAs is the way it facilitates the reification of (fundamentally unjust) social categories as biological realities. If PSAs are not "genes for race," they are at least differentially associated with the people we classify in particular races. Genetic association, however, in the public and scientific mind, often comes to imply causation, which implies in turn the objective reality of the effect. In other words, if PSAs "travel" with racially defined populations, they must be linked somehow with the defining genes of those populations; and if the racial populations have defining genes, races must be real and separable biological entities, not just social constructions.

Our society has had recurrent experience with this kind of "hardening of the categories," all of which has been detrimental to the least well off.[51] This is because this kind of thinking fosters a particular form of social harm: the erosion of our sense of solidarity as a community and our empathy for members of other groups, leading to what one scholar has called social policies "moral abandonment."[52] Any widespread iDNAfication program that involved PSA-based "ethnic affiliation estimations" would run the real risk of exacerbating that harm, by fostering the public perception that PSA-based "ethnic affiliation estimations" revealed real "races" and racial assignments. The problem would only be compounded if such specialized profiles were also evaluated against a backdrop of reference groups also defined in terms of social perceptions of race.[53]

There is no reason to drive technological wedges into the social cracks that already divide us if we can avoid it. Thus, an important requirement for any iDNAfication program should be that, in recognition of the subjectivity of racial categories and the social harms that they facilitate, *any iDNAfication program should exclude the use of markers defined in terms of and aimed at identifying membership in terms of our societal notions of race.*

51. *See generally, e.g.*, Troy Duster, *Genetics, Race, and Crime: Recurring Seduction to a False Precision*, *in* DNA ON TRIAL: GENETIC IDENTIFICATION AND CRIMINAL JUSTICE 129 (Paul R. Billings ed., 1992) (discussing the connections between race, crime, genetics and ethnicity); JOHN S. HALLER, JR., OUTCASTS FROM EVOLUTION: SCIENTIFIC ATTITUDES OF RACIAL INFERIORITY, 1859-1900 (1971) (exploring how the science of the time helped to rationalize the theory of racial inferiority in America); EDWARD J. LARSON, SEX, RACE, AND SCIENCE: EUGENICS IN THE DEEP SOUTH (1995) (discussing sterilization to prevent certain inferior portions of the population from reproducing in the historical "Deep South").

52. *See* Wasserman, *supra* note 27, at 16-18.

53. *See* Paul Rabinow, *Galton's Regret: Of Types and Individuals*, *in* DNA ON TRIAL: GENETIC IDENTIFICATION AND CRIMINAL JUSTICE 5, 14-16 (Paul R. Billings ed., 1992).

C. *Dragnet Uses*

Finally, there is a third set of choices about the range of use to which any arrestee iDNAfication system should be put. Given our commitment to the presumption of innocence, should such a system accommodate "sweep searches" of its stored profiles in the pursuit of a criminal suspect? Obviously, in addition to the precise identification of sample sources, the principal purpose of the existing convicted offender iDNAfication databanks in law enforcement is to aid in the identification of suspects by matching unidentified DNA samples from a crime scene with an identified profile in the collection.[54] If in fact we kept the informational content of arrestee iDNAfication under the pattern-matching standard of manual fingerprinting, could we really complain about police searches of arrestee iDNAfication databases for the same purpose?

On one hand, it is clear that some dragnet uses of iDNAfication would not be acceptable in the United States. Critics of current forensic iDNAfication programs often point to the 1987 British case, in which every male resident in three Leicestershire villages was asked to voluntarily provide DNA samples to the police in an (ultimately successful) effort to identify a murderer, as an cautionary sign of things to come.[55] However, given the coercive nature of such a request (police made house calls on those failing to appear for sampling), its effect of shifting the presumption of innocence to one of guilt, its lack of adequate probable cause, and the U.S. Supreme Court's rejection of similar uses of manual fingerprinting,[56] it seems implausible that such a sampling practice would be considered constitutionally sanctioned in the United States. Concerns that "courts will allow testing of everyone in the vicinity of crime" on the grounds that "[i]nnocent people will have nothing to fear,"[57] are overblown under today's legal system.

However, what if the dragnet were only a matter of searching a database of DNA profiles previously collected by the state for the

54. *See, e.g.*, DNA Identification Act, 42 U.S.C. § 14132(b)(3) (1994) (on the legitimate uses of the NDIS).

55. *See generally* JOSEPH WAMBAUGH, THE BLOODING (1989) (discussing the "world's first murder case to be resolved by 'genetic fingerprinting'")(author's note).

56. *See* Davis v. Mississippi, 394 U.S. 721, 728 (1969) (holding warrantless fingerprinting based on racial profile to be unconstitutional).

57. Eric Lander, *DNA Fingerprinting: Science, Law, and the Ultimate Identifier*, *in* THE CODE OF CODES: SCIENTIFIC AND SOCIAL ISSUES IN THE HUMAN GENOME PROJECT 191, 209-10 (Daniel J. Kevles & LeRoy Hood eds., 1992).

identification of arrestees? In supporting the existing convicted offender iDNAfication databases, the courts have argued that the public interest in prosecuting crime outweighs any right of privacy that criminals may have in future cases, thus justifying the reuse of their DNA fingerprints for forensic matching.[58] Moreover, we do already store and re-use arrest photographs and manual fingerprints, even from those arrestees subsequently cleared of their charges in attempting to identify suspects in future cases. Why should arrestee DNA fingerprints be handled differently?

Here is where the uniquely biological side of iDNAfication re-enters the analysis, with its increased claims of physical privacy. U.S. courts have ruled that systematic analyses of tissue samples and body products (as opposed to photos and fingerprints) of unconvicted suspects (as opposed to convicted criminals) are the sorts of searches that are protected by the Fourth Amendment, even when the samples are already in the state's hands.[59] This suggests that, although one's arrest presumes enough probable cause to justify sampling for *identification* purposes, arrestees have not forfeited as much of their presumption of innocence and the physical privacy that attends it as convicted offenders have, whose samples can be searched at will by the state. If these decisions are accepted as precedents for iDNAfication, efforts to screen forensic DNA against a database of arrestee profiles from unconvicted citizens would also have to pass the Fourth Amendment's tests and show probable cause for each attempted match.

Moreover, if anything, the bar to dragnet searches of arrestee iDNAfication collections should be set higher than the bar to searching other tissue samples and body products because DNA profile matching actually poses a greater risk to privacy than other forms of tissue typing. This is because, unlike both fingerprint and urinalysis screening, the process of matching a forensic sample against an iDNAfication database can reveal familial relationships as well as identities. Unlike fingerprints and photographs, in which the environmental vagaries of human development usually work to

58. *See generally, e.g.*, Jones v. Murray, 763 F. Supp 842 (W.D. Va. 1991), *rev'd in part*, 962 F.2d 302 (4th Cir. 1992) (holding that the plaintiffs' "limited interest in not providing a blood sample is outweighed by the very important interest of the State in deterring and detecting recidivist acts").

59. *See, e.g.*, Vernonia Sch. Dist. 47J v. Acton, 515 U.S. 646, 652 (1995) (stating that the compelled collection of urine samples from students was a "search" triggering the protection of the Fourth Amendment).

obscure any convincing evidence of kinship, DNA profiles can demonstrate those relationships in clear genetic terms.

Thus, when noncoding nuclear DNA markers are used to profile a forensic specimen, the siblings, parents, and children of the specimen source will all show partial matches with the specimen. Their appearance in an arrestee iDNAfication database will not make them direct suspects because of the mismatching elements of the profile. But their matching elements can reveal that they are related to the suspect, and so will flag their family for further investigation by the police.

Moreover, when mitochondrial DNA is used for genotyping, the resulting profiles will almost always be completely shared by the DNA source's mother and siblings, and by her mother and all her siblings as well. They are all essentially mitochondrial clones. In these cases, the appearance of these family members in an arrestee database might even make them immediate suspects for investigation.

In any case, the disclosure of the identities of a suspect's relatives is not something that fingerprint searches accomplish, which means that iDNAfication puts more personal information at risk. It, therefore, poses a greater threat to the privacy of both the arrestees and their kin. Moreover, experience from clinical DNA testing within families demonstrates that even in a supportive context, the disclosure of familial relationships can have tremendous psychosocial impact on family members.[60] To have those relationships disclosed publicly in the context of a criminal investigation only amplifies the risk that that impact will be negative on both the sample sources and their kin.

It is interesting to note in this regard that some states' convicted offender iDNAfication databanking statutes already include provisions mandating the expungement of a person's DNA profile, and the destruction of their samples, if their convictions are overturned or dismissed on appeal.[61] The only circumstance in which this happens with traditional fingerprints is in case of juvenile acquittals, where expungement is justified in terms of the burden of an early criminal record on the life prospects of the acquitted. This

60. *Cf.* Paula R. Winter et al., *Notification of a Family History of Breast Cancer: Issues of Privacy and Confidentiality*, 66 AM. J. MED. GENETICS 1 (1996) (discussing privacy and social issues arising from notifying an individual of a family history of breast cancer).

61. *See generally* Jean E. McEwen & Philip R. Reilly, *A Review of State Legislation on DNA Forensic Data Banking*, 54 AM. J. HUM. GENETICS 941 (1994) (documenting expungement policies in state statutes).

suggests that having one's DNA on file with the state is also recognized, at least in some states, to carry privacy risks to the individual that are unfair to impose on citizens cleared of criminal guilt in the same way it is unfair to impose a criminal record on a reformed youth. But if that is true of those whose convictions are overturned, it should be equally true for those who are never convicted in the first place.

This suggests a final important prerequisite for our widespread iDNAfication program: *in order to respect the presumed innocence and personal privacy of unconvicted individuals, any prospective investigatory use of iDNAfication collections should be limited to samples from those who have already forfeited their relevant privacy rights through conviction.* Of course, one consequence of this recommendation is a relative loss in the program's power to help prosecute crime, which law enforcement officials may regret; however, that, as they say, is the price of a free society.[62]

CONCLUSION

If iDNAfication techniques could be designed and used in ways that reduced their personal and social risks to those already borne by manual fingerprinting, these techniques could be useful supplements to our current means of personal identification. However, to summarize, five conditions would have to be met before any iDNAfication program could meet the pattern-matching standard set by our current use of fingerprinting and photography as identification tools:

1. To adequately protect the informational privacy rights of the identified individuals, any iDNAfication system must be strictly limited to noncoding DNA markers. In particular, markers that are framed in terms of race should be avoided.

2. Any DNA samples from which iDNAfication profiles are drawn must be typed promptly after being drawn and destroyed promptly after typing.

3. To the extent that research on DNA typing techniques and markers is required, independent DNA sample collections should be developed on the basis of voluntary donations from people outside

62. *Cf.* Dorothy Nelkin & Lori Andrews, *DNA Identification and Surveillance Creep*, 21 SOC. HEALTH & ILLNESS 689 (1999) (on the problems of "surveillance creep" as growing numbers of people have their DNA on file).

the system, in the context of the normal regulations for human subjects research. No open-ended research access should be allowed, under any arrangement.

4. Because of the possible impact of widespread iDNAfication on public attitudes, care should be taken not to reinforce subjective and unjust racial categories in the development of background frames of statistical reference for the system.

5. In order to preserve the rights of citizens to presumptive innocence, no arrestee, forensic, or suspect DNA profiles should be banked for use in subsequent investigations unless and until the DNA source is convicted of a crime.

Accepting these conditions as prerequisites for iDNAfication will, of course, require a substantial reform and retro-fitting of many existing state forensic iDNAfication systems and the military's standing collection of "DNA dogtags." It would also mean foregoing the incorporation of any unconvicted citizens' iDNAfication profiles into the state's searchable law enforcement databanks, even when they are stored by the state for other humanitarian identification purposes. In a Communication Age like ours, the maintenance of multiple, unlinked collections of iDNAfication records may come to be seen as inefficient and old-fashioned. But they may also become unavoidable if we are to simultaneously exploit our genetic individuality and keep it from individuating us unfairly.