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A GENETIC TATTLE TALE BASED ON FAMILIAL DNA

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Probable Cause from Probable Bonds: A Genetic Tattle Tale Based on Familial DNA

by Jessica D. Gabel*

ABSTRACT:

DNA represents the “gold standard” of evidence that solves crimes and obtains convictions. Law enforcement agencies increasingly turn to national and local DNA databanks to generate possible suspects. These searches may “hit” upon databank samples that only partially match the DNA left at a crime scene. The value in a partial match is that it might identify a relative of the perpetrator. Some states have embraced this technique - familial DNA testing - as a harmless additive to traditional or routine investigatory methods, but at least one state has explicitly banned its use. This article examines the scientific, legal, and bioethical implications of familial DNA testing. It examines the scientific significance of obtaining a partial match, and questions whether the archetype for determining the existence of a family relationship lacks definition. It considers the legal problems posed by identifying and relying upon innocent people to investigate their family members, including infringements on privacy rights and violations of constitutional requirements. Finally, this article addresses the ethical implications of familial DNA investigations, the tension between resolving crimes and protecting bioinformation, and suggestions to balance the progress of science with the privacy of the person.

I. Introduction

“Fredo, you’re nothing to me now. You’re not a brother, you’re not a friend. I don’t want to know you or what you do. I don’t want to see you at the hotels, I don’t want you near my house. When you see our mother, I want to know a day in advance, so I won’t be there. You understand?” – Michael Corleone (Al Pacino), *The Godfather: Part II*.

Imagine a routine day in your life; your usual chores, errands, and responsibilities. A firm knock at the door disrupts the comfortable character of this average day. Two police officers identify themselves, and explain that they want to ask you a few routine questions in connection with a crime. They explain that DNA recovered from a crime scene was a lot like the

* Assistant Professor, Georgia State University College of Law. The author would like to thank Margaret “Meg” Wilkinson for her support, advice, and solidarity. The early arrival of Meg’s daughter, Daisy, provided new insight and direction for this article. I am eternally grateful to my colleagues, Paul Lombardo and Russell Covey, for their crucial and copious editing. Finally, credit is due to Professor Keith Inman of Cal State East Bay whose patience with my many questions was as invaluable as his scientific knowledge.

DNA of one of your family members (a brother, a sister, a parent), but not a match. Even though the two samples did not match, the officers are certain that someone in your family committed the crime. They want a sample of *your* DNA; perhaps to compare against other family members or perhaps to match to the crime scene. What do you do? Do you submit to having your cheek swabbed or blood drawn and send away your genetic information in a little plastic bottle? What happens to your DNA after the investigation? Can you say no? Do you have a choice? Would you even know if law enforcement already had a sample of your DNA?

Maybe not. Consider the case of the BTK serial killer in Wichita, Kansas. Self-titled “BTK” for “Bind Torture Kill,” the killer kept law enforcement at bay for 31 years (from 1974 to 1995).¹ Ultimately, he took the lives of ten people while he regularly sent notes that taunted the police and media.² BTK went “underground” in the 1990s, during which no murders could be attributed to him.³ BTK resurfaced in 2004 when he sent a letter to *The Wichita Eagle*, claiming responsibility for a 1986 murder.⁴ By virtue of other evidence, suspicion fell on Dennis Rader, a quiet dog-catcher, husband, and father of two children.⁵ Needing to link Rader to DNA collected from several of BTK’s crime scenes, police went to an unlikely source: his daughter.⁶ Instead of the direct approach, however, investigators, armed with a search warrant, seized a tissue sample taken during a routine Pap smear.⁷ Investigators then compared the daughter’s DNA to semen

¹ *Serial Killer’s Big Mistake*, *The Wichita Eagle*, (Dec. 5, 2005), <http://www.kansas.com/btk/archive/story/19184.html> (last visited August 2, 2009).

² *Id.*

³ *Cops Make Arrest in BTK Probe*, *Fox News*, (February 27, 2005) (available at <http://www.foxnews.com/story/0,2933,148794,00.html>) (last visited on August 2, 2009).

⁴ *Id.*

⁵ *Supra* note 1.

⁶ *Id.*

⁷ Ellen Nakashima, *From DNA to Family, a Tool to Make Arrests*, *Washington Post*, (April 21, 2008), http://www.washingtonpost.com/wp-dyn/content/article/2008/04/20/AR2008042002388_pf.html (last visited on August 2, 2009). An exception in the Family Educational Rights and Privacy Act allows law enforcement to obtain a student's health data with a court order. *Id.*

left at the first BTK crime scene in 1974.⁸ The familial DNA comparison confirmed that she was the daughter of the BTK killer.⁹

While there is little argument that the right result was reached – Dennis Rader confessed to being the BTK killer and received a sentence of ten consecutive life terms¹⁰ – there is some question about the means. The BTK case, and the growing number of cases involving familial DNA searches,¹¹ raises legitimate concerns about the rise of the silent informant – a conduit who (sometimes unknowingly) serves as a genetic snitch against someone with a similar DNA profile (a family member). This article will argue that familial searching represents a troubling addition to the increasing collection, retention, and use of genetic information. It presents the issues related to this new level of molecular mining and presents a course of action that attempts to balance the needs of law enforcement with potential bioethical concerns. Before those subjects are discussed, however, it is necessary to discuss the premise of DNA testing, the accuracy of familial DNA testing, and examine the role of the genetic informant.

II. Family Bonding: Questions of Pedigree and Probability

DNA, deoxyribonucleic acid, houses the complete genetic structure of an individual; it is the substance that individualizes each human being.¹² In essence, each person's "uniqueness" starts at a microscopic level with his or her DNA. The study of DNA has catapulted criminal

⁸ *Id.*

⁹ *Id.*

¹⁰ Roxana Hegeman, 'BTK' Serial Killer Sentenced to 10 Consecutive Life Terms, *The Independent* (August 19, 2005) (available <http://www.independent.co.uk/news/world/americas/btk-serial-killer-sentenced-to-10-consecutive-life-terms-503477.html>) (last visited on August 2, 2009).

¹¹ The Denver, Colorado District Attorney's Office maintains an informal database that highlights notable cases involving familial DNA testing. The Denver District Attorney, Mitchell R. Morrissey, pioneered (and vigorously lobbied for) the use of familial DNA database searches in the United States to solve cold cases. The website is available at http://www.denverda.org/DNA/Familial_DNA_Database_Searches.htm (last visited August 2, 2009).

¹² *What Every Law Enforcement Officer Should Know about DNA* (September 1999) (National Institute of Justice, National Commission on the Future of DNA Evidence) (available at <http://www.ncjrs.gov/pdffiles1/nij/bc000614.pdf>) (last visited on August 2, 2009).

investigations into a new age – linking criminals to crime scenes using techniques that only a few years ago were the subject of speculation and science fiction. Today, investigators have an entire DNA arsenal to assist in solving crimes: including mitochondrial DNA, Y-STR testing, DNA databases, and familial DNA testing. This section examines DNA at both the macro and micro levels: from building blocks to databases, the expansion to familial DNA searches, and, finally, an assessment of the accuracy of familial DNA testing.

A. Brass Tacks and Databases

1. From Genes to Genomes: DNA Basics

In recent years, DNA has moved from obscurity to ubiquity. High profile paternity and criminal cases become part of water cooler conversation, and the “ripped from the headlines” approach of popular television programs (such as *NCIS*, *Criminal Minds*, *Forensic Files*, and, of course, the various incarnations of *CSI* and *Law & Order*) continue the soap opera where reality left off. As a result, public acumen casts DNA in an omnipresent role in criminal investigations. The pervasive inference being that DNA can be recovered from almost any crime scene. While this gratuitous conclusion may contribute to the so-called CSI effect,¹³ the simple matter is that the public is more conscious about DNA.

Although the general concept of DNA and its role in criminal investigations seems familiar, the actual science and function of DNA can be elusive, and, frankly, dull. Nonetheless, an explanation of the (trivial) fundamentals is necessary to frame the large picture about the incursion past our genetic boundaries. It sounds illogical that humans – who embrace

¹³ Since the popularity of the television program, prosecutors contend that juries now expect to be presented with scientific evidence in even low-level misdemeanors. This expectation is often termed the “CSI Effect.” Andrew P. Thomas, *The CSI Effect: Fact or Fiction*, Yale L.J. Pocket Part 70 (Feb. 1, 2006) (available at: <http://yalelawjournal.org/2006/02/thomas.html>) (last visited on Jul. 31, 2009).

individuality – are 99.9% identical on a cellular level.¹⁴ With the exception of identical twins, who are 100% alike, only the remaining 0.1% of DNA differentiates each member of the world’s population.¹⁵ Consequently, only that smidge of DNA is forensically significant.¹⁶ It is the portion of our DNA that determines our cherished differences and individual traits: eye and hair color, height, blood type.¹⁷

While this small amount of DNA manifests our cosmetic – or phenotypic – characteristics (such as hair, skin, and eye color), it also contains our genotypic differences - those that do not affect outward appearance, but are nonetheless unique variations in our genetic code (such as blood type, allergies, or the regulation of insulin production).¹⁸ For example, think of our genetic code as a recipe for chicken noodle soup. Assume that 99.9% of your recipe is identical to all other chicken noodle soup recipes. The phenotypic differences are exhibited by the addition of the noticeable ingredients - chicken, carrots, celery, onions, and noodles. The genotypic differences – those not visible – occur at the base level of the recipe for the soup: the amount of salt, broth, and water. Small tweaks to the base recipe, although unseen, will slightly alter the soup’s flavor (genotype). Thus, for purposes of this basic example, the possible variations on the combination of noodles and vegetables, along with the molecular-level differences in the soup base, render each person’s chicken soup unique.¹⁹

DNA is the source of our uniqueness, but that concept does not shed light on what DNA actually is, what it is made of, and how it achieves forensic significance. The average adult body

¹⁴ Lawrence F. Kobilinsky; Thomas F. Liotti; Jamel Oeser-Sweat, *DNA: FORENSIC AND LEGAL APPLICATIONS* 17 (Wiley-Interscience 2004).

¹⁵ Keith Inman and Norah Rudin, *AN INTRODUCTION TO FORENSIC DNA ANALYSIS* 33 (2d ed. CRC Press 2001).

¹⁶ *Id.*

¹⁷ *Id.*

¹⁸ *Id.*

¹⁹ Save for identical twins, who have the exact same soup recipe.

contains approximately 50 – 100 trillion cells.²⁰ Those cells each house a nucleus – the brain of the cell.²¹ Within the nuclei of cells, there are forty-six chromosomes.²² The chromosomes are comprised of DNA strands, in the classic double helix configuration, that envelop a protein backbone.²³ The forty-six chromosomes (made up of DNA and contained in the nucleus of almost every cell) couple together in 23 pairs, with one set inherited from the mother and the other set inherited from the father.²⁴ The chromosome pairs are identified by numbers one through twenty-two; the last pair, which determines a person’s gender, is signified by either XX (females) or XY (males).²⁵ Thus, an offspring’s complete chromosomal package – the 23 pairs – is a recombination of one-half of the father’s chromosomes and one-half of the mother’s chromosomes. The combined result of the parents’ chromosomes (and DNA building blocks) becomes a person’s unique genome, his or her genetic wiring.²⁶

To better illustrate the blueprint of the individual genome, visualize it as a clear ball and inside are the 23 pairs of chromosomes that resemble the favorite childhood candy, gummy worms. The gummy worms are constructed out of billions of “base pairs” of DNA.²⁷ These base pairs (made up of two of the four nucleotides found in DNA) are the “rungs” of the DNA

²⁰ Henry T. Greely; Daniel Riordan; Nanibaa’ A Garrison; Joanna L. Mountain, *Family Ties: The Use of DNA Offender Databases to Catch Offenders’ Kin*, 34 J. Law, Medicine, & Ethics 248, 249 (Summer 2006).

²¹ *Id.*

²² *Id.*

²³ *Id.*

²⁴ *Id.*

²⁵ *Id.*

²⁶ *Id.* Most DNA is packaged in the nuclei of cells, but mitochondria also have a small amount of their own DNA, known as “mitochondrial DNA” or mtDNA. *Id.* Although not the subject of this paper, in short, mtDNA is inherited from the maternal line, and does not change from parent to off-spring (unlike nuclear DNA). M. Schwartz and Vissing, J., *Paternal Inheritance of Mitochondrial DNA*, N. Engl. J. Med. 347 (8): 576–80 (2002).

Recently, forensic investigations have relied upon mtDNA to identify individuals, particularly older skeletal remains. Since it is not nuclear DNA that contains complete genetic information, mtDNA cannot narrow the identification to one person. Nonetheless, when used in combination with other corroborating evidence, identity can be established. James E. Starrs, *Mitochondrial DNA Analysis of the Presumptive Remains of Jesse James, J.* Forensic Sci. 46 (1): 173–6 (January 2001).

²⁷ Greely, et al., *supra* note 20, at 249.

double helix.²⁸ Base pairs are no more than the coupling of nucleotides found in DNA, and like chromosomes, the pairing of nucleotides is formulaic and specific: adenine (A) forms a base pair with thymine (T); guanine (G) pairs with cytosine (C).²⁹ A, T, G, and C represent a genetic alphabet of four letters, and it's the overall arrangement of these letters (nucleotides) serves as an operation manual for the cells. The specific sequencing of letters (DNA nucleotides) form words (genes) that define everything from eye color to shoe size.

Since the word “gene” is often thrown around when discussing DNA, it is important to make the distinction and avoid confusion. Only about two or three percent of the genome has a specific purpose, mostly a “coding” function that instructs cells to perform specific functions.³⁰ A gene is a segment of DNA that contains both coding sequences that determine what the gene does (triggers premature gray hair), and non-coding sequences that determine when the gene is expressed (age 20).³¹ An allele is yet another component of the genetic building blocks. Alleles give genes options. Since each individual acquires two copies of each chromosome, he or she also inherits two copies of each gene (one from the mother and one from the father); the different forms of each gene are called alleles.³² Alleles occupy fixed positions (called a locus for one, loci for two or more) on a specific chromosome.³³

To demonstrate gene variation – alleles – consider the phenotype of blue eyes (the outward manifestation of the gene for eye color). Suppose that Mom has blue eyes. Her two alleles for the eye color gene are “bb.” Since both of Mom’s alleles are the same, she is

²⁸ Cyril T. Wecht and John H. Rado, eds., *FORENSIC SCIENCE AND LAW: INVESTIGATIVE APPLICATIONS IN CRIMINAL, CIVIL AND FAMILY JUSTICE* 421 (CRC Press 2005).

²⁹ *Id.*

³⁰ *Id.*

³¹ Helen Pearson, *What is a Gene?* 441 *Nature* 398–401 (2006).

³² Inman and Rudin, *supra* note 15 at 34.

³³ *Id.*

considered to be *homozygous* at that locus on her chromosome.³⁴ Now suppose that the father has brown eyes, but his two alleles are different: “Bb.” Dad is considered *heterozygous* at that locus.³⁵ The Bb genotype signifies that Dad has one allele for brown eyes and one allele for blue eyes. In a heterozygous situation such as Dad’s, the allele for brown eyes (B) dominates while the allele for blue eyes (b) is recessive. Therefore, Dad exhibits the brown-eyed phenotype.

When it comes to Mom and Dad’s offspring, the resulting eye color depends on which two alleles the child possesses for the gene and how those two alleles interact. The alleles inherited could take on two possible combinations: bb (with Mom and Dad each donating the recessive allele for blue eyes) or Bb (with Dad donating the dominant brown-eyed allele and Mom donating the blue-eye allele). Thus, the odds are even for whether this Mom and Dad will produce a blue or brown eyed child. As with all genes, if both parents possess heterozygous genotypes at a particular locus then the possible genotypes of their offspring increase. For example, if both Mom and Dad had genotypes Bb, their potential offspring could exhibit BB, Bb, or bb genotypes. The phenotypes remain brown or blue for eye color.

2. “Constant Repetition Carries Conviction”³⁶

Humans have approximately 20,000 to 25,000 genes in our genome (the complete genetic package) that serve a variety of functions.³⁷ Our genes, however, “only comprise about 3% of the total human genome.”³⁸ The remainder is “basically one large black box,” with no known function.³⁹ For the time being, scientists categorize this DNA as “junk” DNA.⁴⁰ Thus, more often than not, the genetic alphabet spells gobbledygook that cannot be translated into a known

³⁴ *Id.*

³⁵ *Id.*

³⁶ Robert Collier, American Self-Help Author

³⁷ Greely, et al., *supra* note 20, at 249.

³⁸ *Saved By Junk DNA: Vital Role In The Evolution Of Human Genome*, ScienceDaily (May 30, 2009) (available at: <http://www.sciencedaily.com/releases/2009/05/090528203730.htm>) (last visited on Jun. 1, 2009).

³⁹ *Id.*

⁴⁰ Elizabeth Pennisi, *DNA Study Forces Rethink of What It Means to Be a Gene*, 316 Science 1556–7 (2007).

“language” for cellular function. Indeed, like the leftover tiles of a Scrabble game, junk DNA fails to spell discernible words. Instead, the letters simply occupy space in our genetic gumbo. Given that the coding DNA influences the expression of genes, it would seem reasonable to tap this DNA as a source of identification. To the contrary, however, the non-coding regions of junk DNA actually house the genetic information used to establish identity.⁴¹

In the midst of the genetic morass, identifiable patterns of genetic code emerge in the junk DNA, known as “short tandem repeats” (“STRs”). Although STRs qualify as junk DNA with no known function, they are valuable for their high degree of *polymorphism* – or variation from person to person.⁴² Across these genetic sequences, the STR trips over itself and repeats the same pattern of the nucleotide bases, (G, T, C, or A) a quantifiable number of times.⁴³

Individual STRs average a length of two to five base pairs. The most common is a repeat of four base pairs being repeated, called a tetramer, of which AATG (adenine-adenine-thymine-guanine) is an example.⁴⁴ STRs demonstrate a wide and varied range of repetitions; hence, the polymorphic nature of STRs.⁴⁵

The repeats are the foundation for forensic DNA identification.⁴⁶ The number of times an STR repeats itself is expressed as a value.⁴⁷ For instance, in the STR sequence AATGAATGAATGAATGAATG, the “AATG” region occurs five times in this sequence. In this example, AATG has a value of five. Different people will have different values for AATG (due to their polymorphic nature), but there is not a unique value for each person to the exclusion

⁴¹ Greely, et al., *supra* note 20, at 249.

⁴² *Id.*

⁴³ *Id.*

⁴⁴ *Id.* at 250.

⁴⁵ John M. Butler, FORENSIC DNA TYPING: BIOLOGY, TECHNOLOGY, AND GENETICS OF STR MARKERS, 17-20 (2d Ed. Elsevier Press 2005).

⁴⁶ Alec J. Jeffreys; Victoria Wilson; and Swee Lay Thein, *Hypervariable 'Minisatellite' Regions in Human DNA*, 314 *Nature* 67-73 (1985).

⁴⁷ *Id.*

of all others.⁴⁸ Much like eye color, more than one person has blue eyes, but not all people have blue eyes. STRs, however, have far more variance than eye color, but the number of repeats displayed at a lone STR region is quite common.⁴⁹ Each version of repetition (five, fifteen, twenty repeats) is a distinct allele (the same as blue, brown, or green eyes),⁵⁰ and each allele will be shared by anywhere from five to twenty percent of certain population (usually subdivided by ethnic origin).⁵¹

At a specified locus on the chromosome, each person possesses two copies of the same STR sequence, one from each parent. Since there are two versions of a given STR, there are also two alleles that determine the number of times each copy of the STR sequence repeats itself. The number of times the STR sequence repeats is an allele.⁵² So, for each person, this results in two alleles that determine the how many times each copy of the STR will repeat.⁵³ Therefore, like the alleles for eye color, the individual alleles that determine the number of STR repeats might be the same value (homozygous) or a different one (heterozygous) at that locus.⁵⁴

To simplify, a common STR is AATG.⁵⁵ Dad might contribute an allele that results in 10 repeats of AATG and Mom might contribute an allele for 14 repeats of AATG. Thus, their offspring's genotype at that locus is 9, 10.⁵⁶ The numbers are of little meaning except as identifiers; it is commonly held that the significance of the genotype for STRs found in non-

⁴⁸ *Id.*

⁴⁹ *Id.*

⁵⁰ Greely, et al., *supra* note 20, at 250.

⁵¹ See generally, Eleni Levedokou, et al., *Allele Frequencies for Fourteen STR Loci of the PowerPlex™ 1.1 and 2.1 Multiplex Systems and Penta D Locus In Caucasians, African-Americans, Hispanics, and Other Populations of the United States of America and Brazil*, 46 J. For. Sci. 736-761 (2001).

⁵² Greely, et al., *supra* note 20, at 250.

⁵³ *Id.* at 249-50.

⁵⁴ Greely, et al., *supra* note 20, at 250.

⁵⁵ John M. Butler, *Genetics and Genomics of Core Short Tandem Repeat Loci Used in Human Identity Testing*, 51 J Forensic Sci 253, 255 (2006)

⁵⁶It might be helpful to think of alleles as “variations on a theme.” Inman and Rudin, *supra* note 15 at 34. Here, the theme is the number of repeats an STR demonstrates at a specific locus.

coding regions of our DNA stops at the numeric values of the repeats. Because STRs currently are thought to lodge junk DNA, there is no known phenotypic expression of these allele combinations.⁵⁷ So, a person with genotype of 9, 10 at the AATG locus is no different from another who has a genotype of 7, 7 at the same locus.⁵⁸

3. Fine-tuned Fingerprinting

As with genes, STRs occupy a fixed point on the chromosome.⁵⁹ The locus of a given STR on the chromosome is a known quantity, and can be used as a “marker” for comparison to the STRs of other individuals.⁶⁰ As explained previously, while the repetition of STR alleles varies from person to person, it is not unique among all individuals. Some alleles are more common in certain populations while others rarely occur,⁶¹ but analyzing the various alleles of one STR is not enough to give any definition to identity. On the other hand, scrutinizing multiple alleles of multiple STRs (using a standard array of STRs) enhances the discriminating powers of DNA identification.⁶² Logically, an analysis of multiple loci increases the likelihood that the profile can be narrowed to a single individual.⁶³

In the United States, the vast majority of crime laboratories use thirteen STR markers, referred to as the “CODIS markers.”⁶⁴ CODIS derives its name from the FBI’s Combined DNA Index System.⁶⁵ The thirteen CODIS markers are “autosomal” loci located on twelve of the

⁵⁷ Greely, et al., *supra* note 20, at 250.

⁵⁸ *Id.*

⁵⁹ *Id.*

⁶⁰ *Id.*

⁶¹ *Id.*

⁶² *Id.*

⁶³ Butler, *supra* note 56 at 253.

⁶⁴ *Id.*

⁶⁵ *Id.* CODIS is further discussed in § II.A.4, *infra*.

twenty-two chromosomes that are the identical in both sexes.⁶⁶ Thus, the thirteen CODIS markers remain constant for both men and women.⁶⁷ Since there are two copies of each chromosome, every individual has two copies of the thirteen STRs, meaning that there are twenty-six points of comparison.⁶⁸

The process of collecting and analyzing a DNA profile is often referred to DNA “typing,” “fingerprinting,” or “profiling.”⁶⁹ It is not, however, a profile of a person’s *full* genome; the forensic use of DNA boils down to a small snapshot of an individual’s genetic structure.⁷⁰ When DNA is forensically typed, a computer-generated graph displays a series of peaks that spike quickly like steep mountains.⁷¹ These peaks correspond to the alleles and the computer then labels the alleles based on their length – the number of repeats.⁷² So, for a complete analysis of the thirteen CODIS markers, there will be either two peaks (heterozygous) or one peak (homozygous) at each locus that reflect the allele from the mother and the allele from the father.⁷³ Thus, under the CODIS system, a person’s “DNA fingerprint” consists of the twenty-six allele values that correspond to the number of repeats exhibited by that individual at the thirteen CODIS markers.⁷⁴

⁶⁶ *Id.* A “fourteenth” CODIS marker is also analyzed on the twenty-third chromosome in order to determine the gender of the DNA source. Butler, *supra* note 56, at 253. Since this marker only distinguishes gender, the thirteen CODIS markers are the “core loci” of DNA identification. *Id.*

⁶⁷ *Id.*

⁶⁸ *Id.*

⁶⁹ *See generally*, Butler, *supra* note 46, at 2. A whole genomic profile entails decoding the entire spectrum of DNA in the body, including mitochondrial DNA. The FBI articulates this process as similar to running fingerprints through the Automated Fingerprint Identification System (AFIS), although as discussed, *infra*, that analogy is misplaced.

⁷⁰ A genome profile will reveal diagnostic information, including medical history and disease information. The magnitude of the data is tremendous, since there are roughly six billion base pairs in a human genome. Nacia Grant Cooper, *THE HUMAN GENOME PROJECT: DECIPHERING THE BLUEPRINT OF HEREDITY* 316-318 (rev. ed. University Science Books 2006). On the other hand, a DNA profile mainly focuses on the likelihood that the biological sample came from a specific person, and (purportedly) reveals only innocuous information about STR alleles.

⁷¹ Inman and Rudin, *supra* note 15, at 97-139.

⁷² Butler, *supra* note 46, at 23-25.

⁷³ Greely, et al., *supra* note 20, at 250.

⁷⁴ Butler, *supra* note 46, at 23-25.

4. “The Next Stage in Banking”⁷⁵

By probing thirteen loci (the United Kingdom uses ten), the CODIS system aims to be an effective tool in exacting the identity of an individual, to the exclusion of all others.⁷⁶ DNA is like a shiny new brand of criminal investigation tools. Fingerprints and mugshots seem slightly outdated. James Watson and Frederick Crick cracked the mystery of the double helix in 1953 and removed it from obscurity.⁷⁷ By 1984, Alec Jeffreys, a British geneticist, pioneered DNA fingerprinting, using it in immigration, criminal, and paternity cases.⁷⁸ In 1987, DNA left by the perpetrator solved a rape case in Orlando, Florida, making it the first conviction in the nation won, in part, by using DNA evidence.⁷⁹

As the science of DNA developed, law enforcement officials quickly saw its potential: hard science solving cases (and increasing the conviction rate).⁸⁰ DNA evidence would save time, narrow the suspects, and ultimately solve more cases.⁸¹ The use of DNA in criminal cases expanded at breakneck speed. Not only could it identify the guilty, but it could also exonerate the innocent.⁸² By the mid-1990s, DNA evidence was well on its way to becoming a “critical component” of criminal justice system.⁸³ The O.J. Simpson trial in 1995 brought the significance of DNA into the mainstream.⁸⁴

⁷⁵ Wells Fargo slogan (available at <http://www.textart.ru/database/slogan/3-bank-advertising-slogans.html>) (last visited on Aug. 6, 2009).

⁷⁶ Ron C. Michaelis; Robert G. Flanders, Jr.; & Paula H. Wulff, *A LITIGATOR’S GUIDE TO DNA* 105 (Elseiver 2008).

⁷⁷ James Watson and Frederick Crick F.H.C., *A Structure for Deoxyribose Nucleic Acid*, 171 *Nature*: 737–738 (1953).

⁷⁸ *DNA’s Twists of History*, U.S. News & World Report (available at: <http://www.usnews.com/usnews/culture/articles/030224/24dna.b.htm>) (last visited August 5, 2009).

⁷⁹ *Andrews v. State*, 533 So. 2d 841, 842-43 (Fla. Dist. Ct. App. 1988), *review denied*, 542 So. 2d 1332 (Fla. 1989).

⁸⁰ Michaelis, et al., *supra* note 77, at xiii.

⁸¹ *Id.*

⁸² *Id.* at 369.

⁸³ *Id.* at xiii.

⁸⁴ See William C. Thompson, *DNA Evidence in the O.J. Simpson Trial*, 67 U. Colo. L. Rev. 827 (1996).

The proliferation of biological evidence collected in criminal cases directly correlates to the advancements in DNA technology.⁸⁵ As scientists were able to extract testable DNA samples from smaller and varied specimens, evidence rooms were bombarded with unprecedented amounts of biological material. As DNA harvesting went beyond the bounds of blood, evidence took the form of semen, saliva, hair, tissue, bones, teeth, and sweat found on or in clothes, soda cans, hairbrushes, toothbrushes, stamps, envelopes, Kleenex, chewing gum, cigarette butts – anything a person would come in contact with.⁸⁶ The places where DNA could be found became a smorgasbord of opportunity, and DNA was well on its way to becoming the “gold standard” of forensic analysis.⁸⁷ Indeed, by 1995, challenges to DNA as evidence of identity lost their steam.⁸⁸

With the amount of DNA evidence being used in criminal cases, governments saw a practical reality: the need to house, maintain, and recall the DNA profiles of offenders for use in solving other crimes. The United Kingdom (“UK”) led the charge with its “aggressive approach” to DNA profiling, and created the most comprehensive DNA database in the world.⁸⁹

To tackle the issue, state and federal agencies began to log DNA profiles into large computer databases – DNA databases.⁹⁰ In 1990, the FBI created the Combined DNA Index System

⁸⁵ Wecht, et al., *supra* note 28, at 421-422.

⁸⁶ *Id.*

⁸⁷ Paul C. Giannelli, *Wrongful Convictions and Forensic Science: The Need to Regulate Crime Labs*, 86 N.C. L. Rev. 163, 171 (2007) (noting DNA profiling as “the current gold standard in forensic science”).

⁸⁸ Wecht, et al., *supra* note 27, at 421 (citing *People v. Castro*, 545 N.Y.S. 2d 985 (N.Y. Sup. Ct. 1989)).

⁸⁹ Kenworthy Bilz, *Self-Incrimination Doctrine Is Dead; Long Live Self-Incrimination Doctrine: Confessions, Scientific Evidence, and the Anxieties of the Liberal State*, 30 Cardozo L. Rev. 807, 819 (2008).

⁹⁰ DNA Initiative: *Advancing Criminal Justice through DNA Technology*, Combined DNA Index System (*available at* <http://www.dna.gov/dna-databases/codis>) (last visited on Aug. 6, 2009). It should be noticed that the terms “databank” and “database” are often used interchangeably, which is technically incorrect. Under scientific convention, “database” refers to a “digitized set of profiles,” and “data bank” is the repository that encompasses “both physical samples and profiles.” David Lazer and Viktor Mayer-Schönberger, *Statutory Frameworks for Regulating Information Flows: Drawing Lessons for the Dna Data Banks from Other Government Data Systems*, 34 J.L. Med. & Ethics 366, 371 note 56 (2006). Thus, the physical samples (i.e., the DNA from the saliva swab) reside in the databank, while the data generated from that sample – the genetic CODIS profile – is uploaded into a database and can later be searched. *Id.*

“CODIS”), from which the CODIS STR markers derive their name.⁹¹ CODIS was designed to coordinate the various national, state, and local DNA databases in a centralized system, and “foster the exchange and comparison of forensic DNA evidence from violent crime investigations.”⁹² In 1994, the DNA Identification Act (“DNA Act”) authorized the FBI to create the National DNA Index System (“NDIS”).⁹³

In addition to warehousing the National DNA database, NDIS is linked into CODIS-affiliated labs at the local and state level. NDIS stockpiles DNA profile records entered by local, state and federal enforcement agencies.⁹⁴ CODIS supports NDIS as an “automated DNA information processing and telecommunication system.”⁹⁵

An array of DNA profiles are entered into CODIS from laboratories at the local, state, and national levels.⁹⁶ This three-tier structure functions as a food chain, where information at the lowest level is fed into larger mouths (databases). It begins at the local level (LDIS – Local DNA Index System) where local laboratories take samples from both crime scenes and offenders and generate them into CODIS profiles.⁹⁷ At the second level (SDIS – State DNA Index System), state law enforcement agencies input this information into their statewide databases.⁹⁸ At the top

⁹¹ *Id.*

⁹² Federal Bureau of Investigation, CODIS (*available at* <http://www.fbi.gov/hq/lab/html/codis1.htm>) (last visited on Aug. 6, 2009).

⁹³ Federal Bureau of Investigation, CODIS Brochure (*available at* <http://www.fbi.gov/hq/lab/pdf/codisbrochure2.pdf>) (last visited on Aug. 6, 2009).

⁹⁴ DNA Initiative: Advancing Criminal Justice Through DNA Technology, DNA Databases: Levels of the Database (*available at* <http://www.dna.gov/dna-databases/levels>) (last visited on Aug. 6, 2009).

⁹⁵ *Id.*

⁹⁶ *Id.*

⁹⁷ *Id.* All profiles originate at the local level, and then flow into the state and national databases. *See* CODIS Brochure, *supra* note 94.

⁹⁸ *Id.* Laboratories *within* states can exchange information through SDIS. *See* CODIS Brochure, *supra* note 94.

of the database food chain – the national level – state profiles are uploaded into NDIS.⁹⁹ NDIS will reject samples that do not have results at 10 or more of the CODIS core loci.¹⁰⁰

In terms of criminal investigations, CODIS draws from two indices: DNA profiles of individuals (mostly convicted offenders), and the other containing unidentified DNA from crime scenes.¹⁰¹ As it pertains to federal offenders, the DNA Act, and its later amendments, requires collection of DNA samples from those convicted of, among other things, any felony, any crime of violence, certain sexual offenses, and conspiracy to commit those crimes.¹⁰² The majority of DNA profiles stored in NDIS are those of convicted felons who have served time for crimes such as assault and battery, rape, murder, and robbery, but the DNA Act now provides for DNA collection from individuals on probation, parole, and supervised release for federal offenses.¹⁰³ Nevertheless, the genetic profiles of those convicted did not satisfy the NDIS appetite, so the DNA Fingerprint Act of 2005 now allows the DNA samples of federal arrestees to be maintained in NDIS.¹⁰⁴

In addition to the federal provisions regarding the collection and maintenance of DNA samples from offenders (and alleged offenders), all fifty states now have similar provisions that mandate DNA databases, although states are at liberty to designate the types of crimes that

⁹⁹ *Id.* NDIS enables laboratories to exchange and compare information on a national scale. *See* CODIS Brochure, *supra* note 94.

¹⁰⁰ DNA Initiative: Advancing Criminal Justice Through DNA Technology, DNA Databases: NDIS Procedures and Administration (*available at*: <http://www.dna.gov/dna-databases/ndis/>) (last visited on Aug. 6, 2009). States are responsible for establishing individual policies, generally through legislation, regarding which samples may be added to the state DNA database. States have the ability to set procedures for data entry and search parameters on CODIS within that state. At the national level, however, states should have a degree of uniformity about the use of CODIS. *Id.*

¹⁰¹ Elizabeth E. Joh, Commentary, Reclaiming “Abandoned” DNA: The Fourth Amendment and Genetic Privacy, 100 Nw. U. L. Rev. 857, 876 n.97 (2006). CODIS does include other indices: the Arrestee Index, the Missing or Unidentified Persons Index, and the Missing Persons Reference Index. *See* CODIS Brochure, *supra* note 87.

¹⁰² 42 U.S.C. § 14135a(d)(1)-(4).

¹⁰³ 42 U.S.C. § 14135a(a)(2) (2000).

¹⁰⁴ 42 U.S.C. § 14132(a) (2005)

require DNA samples and whether or not arrestees will be included.¹⁰⁵ Nearly one-third of the states allow for the inclusion of arrestees' DNA profiles.¹⁰⁶ In addition, individual profiles remain in CODIS indefinitely – unless that individual petitions either the federal or state government for expungement of the profile.¹⁰⁷ Of course, the individual must produce “a certified copy of a final court order establishing that such charge has been dismissed, has resulted in an acquittal, or that no charge was filed within the applicable time period.”¹⁰⁸ There is no similar expunction scheme for profiles in the forensic index since those are unknown profiles in unsolved cases.

¹⁰⁵ Lazar and Mayer-Schönberger, *supra* note 91 at 371.

¹⁰⁶ Eileen Sullivan, *Feds To Collect DNA from Every Person They Arrest*, San Francisco Chronicle, April 16, 2008 (describing plans of federal government to expand database to include arrestees' profiles and noting that at least thirteen states have similar provisions, including: Alaska, Arizona, California, Kansas, Louisiana, Maryland, Minnesota, New Mexico, North Dakota, South Dakota, Tennessee, Texas and Virginia).

¹⁰⁷ Federal Bureau of Investigation, Expungement of DNA Records in Accordance with 42 U.S.C. § 14132(d)(1)(A) (*available at*: <http://www.fbi.gov/hq/lab/html/expungement.htm>) (viewed on August 7, 2009).

¹⁰⁸ *Id.*

5. Database, Database Make Me A Match

Having covered the stratification of DNA databases, several points should be made about the mechanics of the “match” process. As explained above, profiles of biological evidence recovered from a crime scene are stored in the forensic index and individuals’ DNA profiles are kept in the offender index. Profiles in the forensic index may be from recent cases or “cold” cases, which have languished on, unsolved for years, but for which biological evidence remains intact and profiled.¹⁰⁹ The profiles from the forensic index are run in CODIS against the offender index to find a potential match between the unidentified crime scene sample and a specific offender.¹¹⁰

For any given search, there is a lot to choose from. The NDIS contains over 7,137,468 offender profiles and 272,452 forensic profiles as of June 2009.¹¹¹ According to the Federal Bureau of Investigation, the success and utility of the CODIS program “will be measured by the crimes it helps to solve.”¹¹² CODIS tracks its progress by using the “Investigation Aided” metric, which tallies the number of criminal investigations where CODIS has “added value” to some aspect of the case.¹¹³ According to June 2009 statistics, the CODIS program has produced over 93,200 hits assisting in more than 91,800 investigations.¹¹⁴

A “hit” occurs when an offender profile matches a crime scene sample at all thirteen CODIS markers.¹¹⁵ A “cold hit” occurs when an offender profile is linked to a cold case years after the

¹⁰⁹ Butler, *supra* n 46 at 1-13.

¹¹⁰ *Id.*

¹¹¹ Federal Bureau of Investigation, CODIS-NDIS Statistics (*available at*: <http://www.fbi.gov/hq/lab/codis/clickmap.htm>) (last visited on Aug. 6, 2009).

¹¹² *Id.*

¹¹³ *Id.*

¹¹⁴ *Id.*

¹¹⁵ *Id.* at 446.

crime was committed.¹¹⁶ If there is a match to an offender, the police consider that person a likely suspect, and the hit typically serves as probable cause for law enforcement to obtain an additional DNA sample from the person identified by the database search.¹¹⁷

The premise of the “hit” seems clear-cut since a computer is doing the heavy lifting, but a complex collection of issues present themselves once the search is underway. First, a computer does not announce a match.¹¹⁸ Rather, the computer presents a DNA analyst with a “reasonable number” of possible matches to examine further.¹¹⁹ In the best case scenario, when all alleles at all loci correspond between the forensic profile and the offender profile, the analyst can declare a match.¹²⁰ Often, however, profiles collected from crime scenes and uploaded into the forensic index are incomplete due to degradation or small sample size.¹²¹ Recall that CODIS requires the presence of alleles at only ten STR markers for a valid forensic sample, making a match at all CODIS markers impossible.¹²² Indeed, when alleles are not visible at all loci, an analyst cannot make an accurate match, and this presents a problem in terms of identification.¹²³ To

¹¹⁶ George Clark, *Justice and Science: Trials and Triumphs of DNA Evidence* 179-86 (Rutgers University Press 2007).

¹¹⁷ Richard H. Walton, *Cold Case Homicides: Practical Investigative Techniques* 352, 355 (2006).

¹¹⁸ Inman and Rudin, *supra* note 15 at 168.

¹¹⁹ *Id.* The science of DNA is sound, but, as other scholars’ articles rightly point out, errors can be made by analysts who evaluate the results of DNA tests. See Tania Simoncelli and Barry Steinhardt, *California’s Proposition 69: A Dangerous Precedent for Criminal DNA Databases*, 34 J.L. Med. & Ethics 199 (2006) (noting the errors associated with DNA analysis since “significant ambiguity can arise in interpreting the computer-generated graph displays that are produced in DNA testing.”). A particular problem is the interpretation of results when there is a mixture of two or more sources of DNA. *Id.* As Simoncelli and Steinhardt point out, these causes make it “difficult to determine which alleles go with which contributor.” *Id.* Those points are valid and real, but beyond the scope of this paper. This section focuses on the objective components of DNA testing, but the reader should neither ignore nor discount the fact that not all DNA is science and in some instances the art (of interpretation) can obscure the science. See also Erin Murphy, *The New Forensics: Criminal Justice, False Certainty, and the Second Generation of Scientific Evidence*, 95 Cal. L. Rev. 721, 754-57 (2007) (enumerating the multitude of scandals that have plagued forensic DNA analysis).

¹²⁰ Inman and Rudin, *supra* note 15 at 168.

¹²¹ *Id.*

¹²² *Id.*

¹²³ *Id.*

compensate for this difficulty, the CODIS program allows the analyst “flexibility” when choosing “specific match criteria for the computer to follow during a search.”¹²⁴

Flexibility means choices, and an analyst can adjust a search from four different match criteria: (a) stringency; (b) minimum number of loci required for a match; (c) loci exclusion; and (d) indexes to search.¹²⁵ This article focuses mainly on adjustments to the stringency of search. In a high stringency search – the most discriminating of search parameters – the number of alleles and allelic values must be identical. In other words, the crime scene sample and the offender sample must have the same amount of and value of alleles at all loci.¹²⁶ In that instance, the match is made, and the offender is the likely *source* of the DNA sample at the crime scene, with likeliness expressed as a statistic, discussed *infra*.¹²⁷ By contrast, a low stringency search is one where both the crime scene and offender samples have at least one allele in common (one out of twenty-six possible commonalities).¹²⁸ In the middle of the mix is a moderate stringency search which is a hybrid of the two. Some, but not all of the alleles needed to match, different labs may set their own benchmark of what amounts to a “moderate” stringency search.¹²⁹

Consequently, as the stringency of a search decreases, the further the search moves away from finding a true match. Instead, the search morphs into one for a “partial” match.¹³⁰ A partial match can occur in one of two ways. The first, often called database “trawling,” involves running a *degraded* crime scene sample¹³¹ against the offender index (or a subset thereof) for the

¹²⁴ *Id.*

¹²⁵ *Id.* at 168-170.

¹²⁶ *Id.* at 168.

¹²⁷ *Id.*

¹²⁸ *Id.* at 169.

¹²⁹ *Id.* at 168.

¹³⁰ Marjan Sjerps & Ate D. Kloosterman, *On the Consequences of DNA Profile Mismatches for Close Relatives of an Excluded Suspect*, 112 Int'l J. Legal Med. 176, 176-178 (1999).

¹³¹ Environmental factors – water, heat, enzymes – eat away at DNA. Over time, DNA deteriorates leaving less viable genetic material in a biological sample available for future testing; ultimately hampering efforts to produce a

chance of a “cold hit.”¹³² In the case of a cold hit, the partial match arises because the complete offender profile is identified as the possible source of the DNA in the incomplete forensic profile.¹³³ In that case, the missing alleles from the forensic sample may well belong to the offender, and law enforcement will seek a fresh sample from that person.¹³⁴ Hopefully, investigators will also search for other corroborating evidence beyond the partial match, but that is not always the case.¹³⁵

A second method for finding a partial match, and the subject of this article, also involves trawling, albeit trawling for innocents. In this scenario, a *complete* forensic sample runs against the offender index for a hit that has some but not all the alleles in common. Since two samples have less than the perfect 13 CODIS markers in common, and only “partially match” at some loci. A partial match here means that the offender¹³⁶ is *not* the source of the crime scene DNA sample since it is clear that some alleles do *not* match. Not a suspect, this person instead becomes a “pivot.”¹³⁷ As a pivot, this individual functions as a genetic beacon who may point the way to the actual source, someone who shares a similar profile with the pivot – a family member.¹³⁸ This familial match is based on the genetic maxim that related persons have far more commonalities in their genetic profiles than do random unrelated persons.¹³⁹

complete profile. When such samples are subjected to STR analysis, it can result in an incomplete profile – where some alleles fail report any value. Butler, (*DNA Typing*) *supra* note 46, at 145-146.

¹³² David H. Kaye ROUNDING UP THE USUAL SUSPECTS: A LEGAL AND LOGICAL ANALYSIS OF DNA TRAWLING CASES 87 N.C. L. Rev. 425, 427 (2009)

¹³³ *Id.*

¹³⁴ *Id.*

¹³⁵ *Id.* (describing the case of John Davis in San Francisco who was arrested for the murder of his neighbor 22 years later. The jury had only the database match as evidence of guilt).

¹³⁶ It is important to point out that even though the sample was from the offender index, that individual may or may not be incarcerated. Absent expungement, all samples remain in the database and are included in searches regardless of release from the correctional system.

¹³⁷ Erica Haimes, *Social and Ethical Issues in the Use of Familial Searching in Forensic Investigations: Insights from Family and Kinship Studies*, 34 J.L. Med. & Ethics 263, 269 (2006).

¹³⁸ *Id.*

¹³⁹ *Id.*

The main difference between these two techniques is in the approach: the cold hit partial match represents an inadvertent hit from a routine search of a database.¹⁴⁰ Conversely, the familial match is made by way of deliberately trolling the database for close biological relatives after the first search fails to produce a perfect match.¹⁴¹ In the cold case, the assumption is that the “hit” is the source of the crime scene evidence. In the familial case, the hit is presumed *related* to the source.

Thus, in a cold case, the offender’s DNA pieces might still fit into the crime scene puzzle. In the familial search, however, the offender has some DNA pieces that will never fit into the crime scene puzzle. The familial search onto the first search after it yields no perfect matches.¹⁴² The more customized familial search then scans the database proactively for possible relatives. Using complicated algorithms, the CODIS software measures the chance (probability) of the source (from the forensic index) being related to the pivot (from the offender index).¹⁴³

On the surface, the premise seems well-intentioned since the obvious goal is to solve a crime. Underneath, however, is a proving ground of potential constitutional and ethical issues. Investigators will seek DNA samples from close relatives of the pivot. Indeed, this type of search – familial search – squarely plops the government in the thick of family bonds. Sections III and IV, *infra*, explore the repercussions often ignored in the haste to adopt new technology.

B. The Family Dynamic

First employed in the UK, familial DNA searching evolved from the basic principle that related persons share a similar, but not identical, genetic profile; identical twins will share the

¹⁴⁰ Jeffrey Rosen, *Genetic Surveillance For All*, Slate Magazine (Mar. 17, 2009) (available at: <http://www.slate.com/id/2213958/pagnum/all/>) (last visited on Aug. 7, 2009).

¹⁴¹ *Id.*

¹⁴² Maura Dolan & Jason Felch, *California Takes Lead on DNA Crime Fighting Technique*, L.A. Times, Apr. 26, 2008.

¹⁴³ *Id.*

exact profile.¹⁴⁴ The value in using familial DNA testing in criminal investigations is uncomplicated. Families spring from the same gene pool and share genetic similarities; common alleles give rise to traits shared within a family – appearance, medical history, and disease vulnerability.¹⁴⁵ As discussed, *infra*, the assumptions associated with familial searching (i.e., a critical mass of common alleles from which relatedness could be inferred) may produce a hidden justification (and broader social implication) that assumes criminal behavior is a trait particular to a family.¹⁴⁶

As explained in section II.A.3, *supra*, the twenty-six alleles of the CODIS markers are directly inherited from one's parents; thirteen from each parent. The profiles of a biological parent and child will have at least thirteen alleles (one at each locus) in common.¹⁴⁷ There may be more if the biological parents randomly have the same allelic values.¹⁴⁸ Siblings, however, are not uniform in the alleles they inherit from their parents (if they were they would be identical twins). A biological parent and child must share at least one allele at each CODIS locus, but siblings may share one, two, or no alleles at a given locus due to the random nature of inheritance¹⁴⁹ (as with example in section II.A.1, *infra*, the brown-eyed father and the blue-eyed mother may have offspring with either brown or blue eyes). At least one study estimates that

¹⁴⁴ Frederick R. Bieber, Charles H. Brenner, and David Lazar, *Finding Criminals through DNA of Their Relatives*, 312 Science 1315 (June 2006).

¹⁴⁵ Studies comparing genetic profiles as between parent and child or between siblings estimate that full siblings share an average of four of the thirteen CODIS markers compared to an average of less than a single locus among unrelated individuals. Kimberly A. Wah, *A New Investigative Lead: Familial Searching as an Effective Crime-Fighting Tool*, 29 Whittier L. Rev. 909, 947 (2008).

¹⁴⁶ Robin Williams and Paul Johnson, *Inclusiveness, Effectiveness, and Intrusiveness: Issues in the Developing Uses of DNA Profiling in Support of Criminal Investigations*, MEDICAL MALPRACTICE: U.S. AND INTERNATIONAL PERSPECTIVES 545, 555 (Fall 2005).

¹⁴⁷ Greely, et al., *supra* note 20, at 252-53.

¹⁴⁸ *Id.*

¹⁴⁹ *Id.*

siblings share an average of 16.7 of the 26 CODIS alleles.¹⁵⁰ Random strangers may only share seven or eight alleles, depending on the rarity of the allele.¹⁵¹

Of course, much of the success of familial DNA searches depends upon the direct genetic relationship – biological parents and children and full siblings.¹⁵² Relationships matter, but familial DNA searches lose their effectiveness (and justification) as the genetic ties weaken.¹⁵³ Nonetheless, profiling the relative of the suspect, from a purely objective standpoint, could provide valuable information to an investigation.

As between parents and children, profiling both parents reveals all the possible alleles (52 in all) that a suspect might possess in a CODIS profile. Thus, that person can be excluded as a suspect or remain a possible source of the crime scene evidence. The reverse analysis – looking to the child’s DNA for clues about the parent-suspect’s DNA – is also possible, as in the BTK case.¹⁵⁴ The results are less concrete, however, when only a partial profile of the parent could be ascertained from the child since a parent contributes just half of the child’s alleles. Clearly, this limitation did not impede the BTK investigation.

Except for the more unusual case like BTK, familial DNA searches and tests generally aim to ferret out a pivot’s sibling who might be the source of DNA left at a crime scene. When cases are solved by virtue of familial DNA searches, the stories dominate the news. Take the case of one sticky brick.¹⁵⁵ In March 2003, someone threw a brick off a bridge in the middle of the night.¹⁵⁶ On the highway below, the brick blew through the windshield of a truck, killing the driver.¹⁵⁷

¹⁵⁰ *Id.*

¹⁵¹ *Id.* at 251.

¹⁵² Williams and Johnson, *supra* note 147, at 554.

¹⁵³ Mark A. Rothstein & Meghan K. Talbot, *The Expanding Use of DNA in Law Enforcement: What Role for Privacy?*, 34 *J.L. Med. & Ethics* 153, 156 (2006).

¹⁵⁴ Nakashima, *supra* note 7.

¹⁵⁵ Jeffrey Rosen, *supra* note 141.

¹⁵⁶ *Id.*

¹⁵⁷ *Id.*

DNA found on the brick (not belonging to the victim) was then run through the UK national database, but failed to yield a match at all 10 loci used by the British.¹⁵⁸ Authorities then instituted a DNA dragnet, seeking voluntary samples from young men in the area. This again produced no results.¹⁵⁹

As a last resort, the Forensic Science Services (FSS) conducted a low stringency search of the national database.¹⁶⁰ FSS limited the search to white males (based on ethnic markers typed in the unknown's profile), under the age of 35, living in the areas of Surrey and Hampshire, southeast of London.¹⁶¹ The familial search produced a list of 25 names with profiles who matched at least eleven of the twenty alleles used in the UK system.¹⁶² The 25 profiles were prioritized by the amount of alleles in common. At the top of the list was a profile that matched the brick profile at 16 loci.¹⁶³ An interview of the individual at the top of list revealed that he had a brother who was 20 years old who lived near the area where the crime was committed.¹⁶⁴ The brother – Craig Harmon – confessed to the crime and was sentenced to six years in prison.¹⁶⁵

As evidenced by the sticky brick case, and others like it, the United Kingdom routinely uses familial searching when a full profile search yields no results.¹⁶⁶ By FSS numbers, the UK has performed 70 familial searches since 2004, resulting in 18 matches and 13 convictions.¹⁶⁷ Mitch Morrissey, the Denver District Attorney, spearheaded the use of familial searching in the United

¹⁵⁸ *Id.*

¹⁵⁹ *Id.*

¹⁶⁰ Forensic Science Service, Case Study – Craig Harman (*available at*: <http://www.forensic.gov.uk/html/media/case-studies/f-39.html>) (last visited on Aug. 6, 2009).

¹⁶¹ *Id.*

¹⁶² Greely, et al., *supra* note 20 at 248.

¹⁶³ *Id.*

¹⁶⁴ *Id.*

¹⁶⁵ *Id.*

¹⁶⁶ Forensic Science Service, Fact Sheet (4): Familial Searching (*available at*: <http://www.forensic.gov.uk/pdf/company/foi/publication-scheme/communications/Familialsearching.pdf>) (last visited on Aug. 6, 2009).

¹⁶⁷ Rosen, *supra* note 141.

States after visiting the UK.¹⁶⁸ Morrissey asked the FBI to relax its policy against familial DNA testing.¹⁶⁹ The FBI did not – and as of this writing – has not wavered on its own position against familial DNA searches.¹⁷⁰

Nonetheless, the FBI has, however, instituted an interim plan for the release of information related to familial searching.¹⁷¹ Under this plan, the FBI defines a partial match as a moderate stringency search that results in two single-source profiles (as opposed to mixed samples with multiple contributors) having at least one allele in common at each locus.¹⁷² When a match occurs at the national search level, NDIS procedures prohibit the release of that individual's identity.¹⁷³ Individual states, however, can make their own decisions on whether they will conduct familial searches in their own databases.¹⁷⁴ At opposite ends of the spectrum are California and Maryland.¹⁷⁵

In April 2008, the California Department of Justice relaxed its policies to allow for familial DNA searches and the reporting of results to authorities for further investigation.¹⁷⁶ The policy shift makes California the national leader in familial DNA searching.¹⁷⁷ Unlike other states, California vigorously pursues familial searching as a matter of policy rather than

¹⁶⁸ *Id.*

¹⁶⁹ *Id.*

¹⁷⁰ *Id.*

¹⁷¹ Federal Bureau of Investigation, Interim Plan for the Release of Information in the Event of a “Partial Match” at NDIS, (Jul. 20, 2006) (*available at*: http://www.bioforensics.com/conference08/Familial_Searches/CODIS_Bulletin.pdf) (last visited on Aug. 6, 2009).

¹⁷² *Id.*

¹⁷³ Rosen, *supra* note 141.

¹⁷⁴ *Id.*

¹⁷⁵ Molly McDonough, *Familial DNA Searches are Creating Genetic Informants*, ABA Journal (April 21, 1998) (*available at*: http://www.abajournal.com/news/familial_dna_searches_are_creating_genetic_informants/) (last visited on Aug. 1, 2009).

¹⁷⁶ Memorandum from Edmund G. Brown, Jr., Att’y Gen. of Cal. to All Cal. Law Enforcement Agencies and Dist. Att’y’s Offices, DNA Partial Match (Crime Scene DNA Profile to Offender) Policy (Apr. 25, 2008) (hereinafter “Partial Match Memorandum”).

¹⁷⁷ Maura Dolan & Jason Felch, *California Takes Lead on DNA Crime Fighting Technique*, L.A. Times, Apr. 26, 2008.

happenstance.¹⁷⁸ California's policy requires a sharing of at least 15 alleles, additional DNA testing, and a prosecution committee review before the pivot's name will be released to authorities. But the policy lacks any similar safeguards for the relatives of the pivot who may be implicated by the results of a familial search.¹⁷⁹ California Attorney General Jerry Brown stated that the new policy was warranted because of the rise in violent crime in the state.¹⁸⁰

In contrast to California, Maryland takes the opposite approach. In 2008, Maryland enacted a law to expand its DNA database to include mandatory samples from anyone charged with a crime of violence.¹⁸¹ Despite this expansion, the law also clearly prohibits a familial trawl of the database to hunt out possible relatives of the source of a DNA sample. *Id.* Polar opposites, California and Maryland respectively represent the aggressive and guarded approaches to familial DNA searching.

C. Accurate Ancestry

If Maryland and the Federal Bureau of Investigation refuse to actively conduct such searches, it prompts one to ask "why?" An initial question might be whether familial DNA searching is a reliable method of identifying possible suspects. Unreliability in this context means that the scientific process underlying familial DNA profiling is somehow dubious. With DNA testing, however, reliability is the wrong question. It is a question of accuracy, as described below. The statistical technicalities and intricacies at play in familial DNA are beyond the scope of this article, but a short summary is (minus the laborious mathematical formulas) is necessary).

¹⁷⁸ *Id.*

¹⁷⁹ *Id.*

¹⁸⁰ *Id.*

¹⁸¹ Maryland State Police, News Release: Governor Signs Legislation to Expand DNA Database And Strengthen Public Safety in Maryland (May 13, 2008) (*available at*: http://www.mdsp.org/Media/press_release_details.asp?identifier=618) (last visited on July 30, 2009).

Accuracy. Assume there are two brothers, “John” and “Joe,” who are not identical twins. If you take a blood sample from each brother and run DNA tests, the same two different but perhaps similar profiles emerge. Much like blood types, an individual’s genetic profile should yield the same result each time (absent lab or analyst errors). Genetic profiles do not deviate; if an analyst runs a sample one hundred times, the test should net the same genetic profile one hundred times. That demonstrates reliability.¹⁸² Here, the better question about John and Joe’s relationship should be couched in terms of accuracy.¹⁸³ Accuracy evaluates whether or not the right result can be reached and what the strength of that result is.¹⁸⁴ In our example, the result sought is how *strong* the likelihood is that John and Joe are related.¹⁸⁵

In the context of a database case, some jurisdictions – like California – follow the prescription that the identity of the offender will not be released to authorities without a showing of the likelihood of kinship between the offender sample and forensic sample.¹⁸⁶ For example, a crime scene sample is run through the database at a moderate stringency (where the two samples must have at least 15 common alleles) against the offender index. Several profiles meet the stringency criteria, and the top profile shows that the offender sample (the pivot) and the forensic sample (the source) have 20 out of 26 alleles in common. Additionally, the pivot and source share a Y chromosome, meaning that they are two males. For the sake of simplicity, assume that there is one locus where no alleles match, meaning that the pivot and source cannot be father and son. The logical conclusion is that the two are brothers. Authorities are eager to look at the pivot’s family members, including any brothers, but the strength of the evidence must be quantified.

¹⁸² Inman and Rudin, *supra* note 15 at 139.

¹⁸³ *Id.*

¹⁸⁴ *Id.*

¹⁸⁵ *Id.*

¹⁸⁶ Partial Match Memorandum, *supra* note 177.

In this case, the hypothesis is that pivot and the source are related (H1). In order to evaluate the strength of this hypothesis, it must be compared to the alternative hypothesis, which is that pivot and the source are not related (H2).¹⁸⁷ The alternative hypothesis is necessary to determine the significance of the match.¹⁸⁸ To quantify the comparison between H1 and H2, both hypotheses (related vs. unrelated) are measured in terms of probabilities, or the chances of that event being true.¹⁸⁹ Note that this inquiry differs slightly from the traditional statistical model for DNA evidence that compares the chance that a suspect is the source of the biological evidence to the chance that the suspect is not the source.¹⁹⁰

There are various methods that can be used to assess the strength of the DNA evidence.¹⁹¹ Some statistical models lead to the mind-numbing “one in one trillion” articulations about the chance that the DNA belongs to anyone other than the defendant.¹⁹² Arguments over the various statistical approaches and the problem of jurors equating such numbers with guilt rather than the true hypothesis (that the defendant is the source of the biological sample) are not the subject of this article, and are better discussed by the National Research Council in two related reports, *NRC I* and *NRC II*.¹⁹³ For familial searches – where the initial inquiry is kinship as opposed to

¹⁸⁷ Inman and Rudin, *supra* note 15 at 139-148.

¹⁸⁸ *People v. Wilson*, 136 P.3d 864, 871 (Cal. 2006).

¹⁸⁹ Inman and Rudin, *supra* note 15 at 139-148.

¹⁹⁰ *Id.*

¹⁹¹ *United States v. Williams*, 2008 WL 5382264 *17-18 (C.D. Cal. 2008) (explaining the competing theories of DNA statistics).

¹⁹² Jonathan Koehler, *On Conveying The Probative Value of DNA Evidence: Frequencies, Likelihood Ratios, and Error Rates*, 67 U. Colo. L. Rev. 859, 860 (1996).

¹⁹³ In 1992, the National Research Council (“NRC”), a branch of the National Academy of Sciences published a comprehensive report on probability calculations related to forensic DNA profiling. National Research Council, *DNA Technology in Forensic Science* 74 (1992) (“*NRC I*”). *NRC I* addressed the “substantial controversy” associated with the proper methodology the statistical rubric used to measure a DNA “match.” *NRC I* questioned the use of the “product rule” used to calculate the frequency of alleles and genetic profiles. *Id.* at 76. For example, if the frequency of an allele is 10% of a given population, then among those population members one in ten will carry that allele. The product rule takes all of the allele frequencies in a profile (thirteen) and multiplies them together to arrive at the frequency of that specific genetic profile (often expressed in terms of one in several million or sometimes billion). *Id.*

determining if a defendant is the source of a crime scene sample – this article advocates for use of the *likelihood ratio* (the “LR”), which is widely used in the UK, but generally limited to use in paternity cases in the United States.¹⁹⁴

The LR compares the two hypotheses and expresses them as a ratio.¹⁹⁵ In other words, to arrive at the LR, you must answer the question of how much more likely is it that the pivot and source are related (H1) than not (H2)?¹⁹⁶ The LR can then be articulated as “it is x times more likely that the pivot and source are brothers than that they are unrelated.”¹⁹⁷ To put numbers to words, the probability of H1 (being related) is generally deemed 1, statistical models initially assume that the two samples came from two related persons.¹⁹⁸ The probability of H2 (that these samples are from two random unrelated persons) is a more difficult number to calculate, but for this example assume that it is 1/100,000. Thus, the LR = 1/(1/100,000). LR = 100,000, meaning that it is 100,000 times more likely that the two are related than it is that they are not.¹⁹⁹

Of course, this would be an easy calculation were it not for the fact that there is wide disagreement over how to arrive at the number for H2 – the probability that two unrelated person will share so many alleles in common.²⁰⁰ The probabilities at issue with DNA typing are based

In the wake of *NRC I*, courts questioned the admission of DNA frequency statistics that were based upon application of the product rule. This reluctance caused the NRC to revisit population genetics and the product rule in 1996. National Research Council, *The Evaluation of Forensic DNA Evidence 97* (1996) (*NRC II*). *NRC II* noted improvements in DNA technology and developments in the study of population subgroups in the intervening years between *NRC I* and *NRC II*. *Id.* 57-80. Ultimately, *NRC II* endorsed the use of racial population databases to generate DNA probabilities across various ethnic and racial groups. *Id.*

¹⁹⁴ Michaelis, *supra* note 77 at 135. In kinship studies, computer simulations indicate a correlation between individuals by using likelihood ratios (LRs). A higher LR translates to a greater the likelihood of relatedness between two individuals. Moreover, these simulations demonstrated that when a biological child’s DNA profile is run against an index of 50,000 offenders, the parent-offender would have the highest LR 50% of the time and a 99% chance of appearing in the top 100 possibilities (ranked by LR). Siblings showed a similar concordance. *See* Wah, *supra* note 146.

¹⁹⁵ Inman and Rudin, *supra* note 15 at 148.

¹⁹⁶ *Id.*

¹⁹⁷ *Id.* at 149.

¹⁹⁸ *Id.*

¹⁹⁹ *Id.*

²⁰⁰ Greely, et al., *supra* note 20 at 253; Michaelis, *supra* note 72, 91-167.

on population genetics.²⁰¹ What seems like a simple matter of calculating a few percentages has actually spawned the most controversy in the broader application of DNA evidence.²⁰² The controversy stems from several sources, not including the debate about which mathematical formula to use.²⁰³

From the use of ethnic population figures that most closely associate with the known ethnicity of the defendant to including racial and ethnic considerations to the allele frequencies, the path to a probability is littered with plenty of obstacles.²⁰⁴ For instance, the probability of the source and pivot being brothers should take the rarity of alleles into consideration.²⁰⁵ Just like the prevalence of brown eyes compared to that of blue eyes, some STR alleles are more common in the population than are others. So if the source and pivot share alleles on the rarer side,²⁰⁶ the probability that they are brothers is higher than if they shared more common alleles.²⁰⁷ There is agreement among scientists that allele frequencies differ for different racial or ethnic populations, and that frequency data would be less accurate without such differentiation.²⁰⁸ Other biological factors affect the probability calculation: common inheritance, likelihood that the parents randomly share a particular allele, as well as commonness of the allele in the population at large.²⁰⁹

²⁰¹ Michaelis, *supra* note 77 at 135.

²⁰² *Id.* at 91.

²⁰³ *Id.*

²⁰⁴ *Id.* at 113-18.

²⁰⁵ *Id.*

²⁰⁶ For example, according to the FBI's population statistics for the CODIS STR markers, the STR known as "D3S1358" has at least twelve different alleles. The allele that expresses 12 repeats of that STR is found in only 0.24% of the African American population. On the other hand, the allele that expresses 15 repeats of the same STR is found in 29% of the African American population. Consequently, a DNA profile that repeats that STR 15 times is more common (at least for that STR locus) than a profile that repeats the STR 12 times. Bruce Budowle, Brendan Shea, Stephen Niezgodka, and Ranajit Chakraborty, *CODIS STR Loci Data from 41 Sample Populations*, 46 J. Forensic Sci. 453, 455 (2001).

²⁰⁷ *Id.*

²⁰⁸ *People v. Wilson*, 136 P.3d 864, 871 (Cal. 2006).

²⁰⁹ Murphy, *supra* note 120 at 738.

Despite these hurdles, (of which related studies and opinions could fill several volumes), the available research suggests that, from a statistical standpoint, “the DNA of related individuals tends to be similar so as to distinguish a relative out of the very large number of non-relatives in the DNA database.”²¹⁰ Although controversial, for reasons described below, practical science demonstrates that familial DNA searches are significantly accurate such that they could in fact assist in criminal investigations.²¹¹ One study estimates that familial searching could give a 40% boost to the number of investigative leads generated from a DNA database search.²¹² Simply because a technology is available, however, does not mean that we should welcome it with open arms. In the discussion below, the legal and ethical quagmires are explored and the article concludes with policy recommendations regarding familial DNA investigations, but the debate must move beyond the threshold inquiry of whether familial searching should be employed. California and other states have already answered that question in the affirmative. Instead, the debate must shift to whether the increasing collection and use of genetic information as a result of familial searches requires management and regulation.

²¹⁰ David Lazar, *Searching the Family Tree for Suspects: Ethical and Implementation Issues in the Familial Searching of DNA Databases*, Harvard University, Taubman Center Policy Briefs 1 (March 2008) (available at: http://www.hks.harvard.edu/taubmancenter/pdfs/policybriefs/lazer_final.pdf).

²¹¹ *Id.*

²¹² *Id.*

III. Sibling Rivalry: Privacy and the Fourth Amendment

In the flurry to adopt sparkly new technology like familial searching, a full exploration of the legality of such searches was neglected. Civil liberty advocates quickly pounced on the opportunity to decry to amount of government intrusion.²¹³ The fear is that the routine practice of familial DNA searching and the corresponding investigations would subject “hundreds of thousands of innocent people” to a lifetime of genetic surveillance by virtue of being related to individuals in the FBI database.²¹⁴ Despite such fears, the Fourth Amendment does not prevent familial DNA searches.

All 50 states and the federal government have enacted statutory DNA database schemes and data bank acts that provide for the collection of DNA samples from convicted offenders.²¹⁵ In addition, federal law and some states mandate DNA samples from arrestees.²¹⁶ Since the 1990s, those who have been required to submit samples have waged constitutional challenges to the laws, and met stiff resistance.²¹⁷ While ethical questions present murkier situations, the legal issues, by and large, come packaged in (one of two boxes): privacy and Fourth Amendment concerns. These inquiries, as they relate to familial searches are two-fold, and not of the

²¹³ McDonough, *supra* note 176.

²¹⁴ *Id.*

²¹⁵ 42 U.S.C. §§ 14131-14134; *see* Miller, *supra* note 205.

²¹⁶ A related issue, but not included in this article, is whether compelling arrestees, individuals who have yet to be convicted of a crime – to submit to a DNA test. In December 2009, the European Court of Human Rights held that the UK could not retain the DNA of unconvicted persons. The court ruled that the policy violated the express guarantees of European privacy. *See* Rosen, *supra* note 136.

²¹⁷ *See, e.g., Roe v. Marcotte*, 193 F.3d 72 (2d Cir.1999); *Schlicher v.(NFN) Peters, I & I*, 103 F.3d 940 (10th Cir.1996); *Boling v. Romer*, 101 F.3d 1336 (10th Cir.1996); *Rise v. State of Oregon*, 59 F.3d 1556 (9th Cir.1995); *Jones v. Murray*, 962 F.2d 302 (4th Cir.1992).

traditional ilk of an offender's interest in his or her DNA (privacy) and the ability of the state to compel an offender to submit a DNA sample (a seizure).²¹⁸

Instead, the primary focus here is two-fold: first, the identity of pivot being released to authorities when it is established that he or she is not the source of the crime scene evidence. Second, the inquiry shifts to the individual whose forensic profile is currently not in any database, and yet authorities would like that person's DNA as well. That individual might be an offender's relative suspected of being the source of a crime scene sample (innocent or not); or someone who has the misfortune of being related to a suspect for whom no DNA profile is in a database (e.g., BTK's daughter). For ease, such individuals will be referred to as a "target" (as distinguished from a pivot or source) - a neutral classification for a person who does not have a profile in the CODIS system and from whom the government would seek a DNA sample. Does a pivot have an expectation of privacy when he or she is not a suspect in the crime? Can a target be compelled to give a DNA sample when a relative's profile partially matches a crime scene sample? Both cases lack legal definition and precedence. Thus, the first line of cases – those related to the mandatory DNA collection provisions for offenders – will be used to shed light on the subject.

A. Skeletons in the Closet

"Privacy is not something that I'm merely entitled to, it's an absolute prerequisite."²¹⁹ Ask most Americans if privacy is a constitutional right, and they will echo Marlon Brando's position. Privacy, of course, is not an express right found in the United States Constitution, although the

²¹⁸ Robin Cheryl Miller, *Validity, Construction, and Operation of State DNA Database Statutes*, 76 ALR 5th 239 (2000). It should be noted that while it is convenient to consider privacy and the Fourth Amendment separately, cases often straddle both boxes with overlapping concerns.

²¹⁹ David H. Holtzman, *Privacy Lost: How Technology is Endangering Your Privacy* 3 (Jossey-Bass 2006) (quoting Marlon Brando).

First, Fourth, and Fifth Amendments afford some modicum of privacy.²²⁰ In the context of DNA collection and analysis, federal privacy inquiries generally fall under a more traditional Fourth Amendment analysis.²²¹ This section, however, considers privacy as an independent right, as is found in some state constitutions.²²²

Privacy is an ever-evolving concept; the amount of intrusion from the Internet and media into our everyday lives demonstrates that the concept of privacy has shifted over the decades. “It would be foolish to contend that the degree of privacy afforded to citizens by the Fourth Amendment has been entirely unaffected by the advance of technology.”²²³ In the context of crime and punishment, most people probably would advocate the use of DNA databases in criminal investigations. After all, isn’t the intrusion minimal if it solves a crime? Besides, the offenders in the databases lost the right to complain when they committed the crime, right? But then ask those same people if they would be willing to give their own DNA, then it becomes a matter most personal and most private.

1. Constitutional Privacy Claims: The One-Size Fits All Database

Could a target maintain a privacy interest in her own DNA profile by virtue of its similarity to a relative’s profile in a database? Doubtful. A striking majority of courts across the country have found that the collection of DNA from offenders pursuant to a statute does not violate the right to privacy of those persons.²²⁴ In the eyes of the law, offenders in the database have lowered expectations of privacy, and any intrusion into a person’s privacy is done

²²⁰ Cornell University Law School, Privacy – Right of Privacy, an Overview (*available at*: <http://topics.law.cornell.edu/wex/privacy>) (last visited on Aug. 2, 2009).

²²¹ See *United States v. Kincade*, 379 F.3d 813, (9th Cir. 2004).

²²² Cal. Const. art. I, § 1. In addition to California, Alaska, Arizona, Florida, Hawaii, Illinois, Louisiana, Missouri, South Carolina, and Washington all have independent rights of privacy in their state constitutions. National Conference of State Legislatures, Privacy Protections in State Constitutions (*available at*: <http://www.ncsl.org/default.aspx?tabid=13467>) (last visited on July 31, 2009).

²²³ *Kyllo v. United States*, 533 U.S. 27, 33-34 (2001).

²²⁴ *Miller*, *supra* note 219.

reasonable in order to maintain public safety.²²⁵ Public safety and lowered privacy expectations are the usual suspects when it comes to denying claims against the taking of DNA samples from offenders. Both traditional and creative attacks on offender DNA collection laws fail to gain relief.

In *Alfaro v. Terhune*,²²⁶ eight women on California's death row challenged the California DNA and Forensic Identification Data Base and Data Bank Act of 1998 (the "California DNA Act"), which required that any convicted person "provide two specimens of blood, a saliva sample, right thumbprints, and a full palm print impression of each hand for law enforcement identification analysis."²²⁷ In a unique argument, the women claimed that the California DNA Act violated their privacy rights (guaranteed by the California state constitution) because one of the major justifications for the policy – crime deterrence – did not apply to death row inmates.²²⁸ Not surprisingly, the court was less than enthusiastic about the plaintiffs' contention. Citing the litany of other states that had upheld mandatory DNA collection from offenders, the court recognized the constitutional interests, but rejected the claims because offenders convicted of serious crimes have a diminished expectation of privacy, the intrusions allowed by the California DNA Act were de minimus, and collection of DNA from offenders served compelling government interests.²²⁹

The *Alfaro* court reasoned that the collection of DNA samples from offenders serves the metaphoric greater good by avoiding wrongful convictions and exonerating the innocent.²³⁰ As with other courts assessing DNA collection statutes, *Alfaro* found that the balance must be struck

²²⁵ *Matter of Appeal in Maricopa County Juvenile*, Action Numbers JV-512600 and JV-512797, 187 Ariz. 419, 930 P.2d 496 (Ct. App. Div. 1 1996), *review denied*, (Jan. 14, 1997).

²²⁶ *Alfaro v. Terhune*, 120 Cal. Rptr. 2d 197 (Cal. App. 3d 2002).

²²⁷ Cal. Penal Code §§ 295 *et seq.*

²²⁸ *Alfaro*, *supra* note 227 at 208.

²²⁹ *Id.* at 207-09.

²³⁰ *Id.*

in favor of the validity of such an Act and against the offender.²³¹ Significantly, the plaintiffs raised the possibility that DNA testing would reveal sensitive personal and biological information.²³² *Alfaro* reached the uniform conclusion that permeates privacy challenges to DNA collection: while such policies are subject to constitutional analysis, the extent of intrusion can be measured by the defined limitations on how the samples and profiles will be used.²³³ *Alfaro* observed that no court has held that a government can extract and analyze a person's DNA for unspecified purposes.²³⁴

This reference to specified purposes is critical. The legislatures of the various states and federal government who enacted the DNA collection statutes did not conceive of familial searches as a potential purpose and use for the collection of the DNA samples. Arguably, an offender could mount a challenge to the use of his or her genetic profile as a pivot to flush out the real perpetrator of a crime – quite possibly a family member. This approach, however, would ring hollow with a court. In *Alfaro*, the court anticipated such an argument (although not in the context of familial searches).²³⁵ The plaintiffs asserted that the California DNA Act's prescription for the use of a DNA sample for "identification purposes" could be broadly applied to "encompass almost any conceivable use of DNA information."²³⁶ The court disagreed and explained that California DNA Act did not permit the state to do "more than standard and usual scientifically appropriate identification analyses with specimens, samples, and print impressions."²³⁷

²³¹ *Id.*

²³² *Id.* at 208-210.

²³³ *Id.*

²³⁴ *Id.*

²³⁵ *Id.* at 209-210.

²³⁶ *Id.*

²³⁷ *Id.*

Other creative efforts have involved “back-dooring” into a privacy claim by way of the Fifth Amendment have likewise fallen on deaf ears. In *Trolinger v. Henry*,²³⁸ an inmate challenged the requirement to submit a DNA sample. In disposing of the petitioner’s claim, the court noted that the interest at issue was one of privacy in identification information.²³⁹ The court determined that DNA “establishes only a record of the defendant’s identity-otherwise personal information in which the qualified offender can claim no right of privacy once lawfully convicted of a qualifying offense” and did not amount to a violation of the Fifth Amendment’s prohibition against self-incrimination.²⁴⁰

Courts are indeed reluctant to find DNA collection from offenders to be more than a trivial intrusion on privacy. Of course, the broad dicta in any of these cases could easily apply to familial searches and nullify any challenge to the scope of a DNA collection statute. Thus, such statutes are one-size fits all, and likely permit the use of offender’s DNA for a broad array of forensic identification purposes, including familial searches. And if offenders lose on claims over the use of their own DNA, then the target likely cannot piggyback a privacy claim onto one that does not exist.

2. Statutory Privacy Claims: Privacy for the People

As compulsory DNA collection became routine, and privacy experts fretted over the commercial use of DNA tests, states and now the federal government passed genetic privacy laws.²⁴¹ For the most part, these laws prohibit genetic discrimination by health insurers and employers, meaning that neither insurers nor employers can require a prospective insured or employee to submit to DNA testing as a prerequisite to being insured or employed. Of course,

²³⁸ 2007 U.S. Dist. LEXIS 77341 (2007).

²³⁹ *Id.*

²⁴⁰ *Id.*

²⁴¹ See 42 U.S.C. § 300gg-53; Mass. Gen. Laws Ann. ch. 111, § 70G(c) (West 2003); Mich. Comp. Laws Ann. §§ 333.17020, 333.17520 (West 2008); Neb. Rev. Stat. § 71-551 (Supp. 2007). Oreg. Rev. Stat. § 192.53, *et seq.*

such laws include exceptions for law enforcement purposes along with provisions for paternity testing and fetal and newborn screening.

Of course, in the context of familial searches none of the above laws afford a target any privacy protection in his or her genetic material. The privacy laws are narrowly tailored to apply in only a handful of settings – mostly, employment, health care, and insurance settings.²⁴² Consequently, these so-called genetic privacy laws do not insulate targets from the reach of law enforcement. Moreover, the legislative history of these statutes makes clear that the intention was to protect individuals from genetic discrimination in obtaining insurance or employment.²⁴³ Little, if any, of the conversation focused on the use genetic information in police investigation. In short, a privacy claim is a weak avenue for a target to exploit.

3. Can You Spare Some DNA?

The above analysis illustrates the implausibility of a colorable privacy claim brought by a target in a familial DNA investigation. Indeed, the concept of genetic privacy remains a distant apparition in most cases, and the same rings true when privacy rights are used as a gateway for a property claim in DNA. The right to privacy has its origins in property law, but the latter has failed to add any credence to an individual's right to control the collection and use of his or her genetic material.²⁴⁴ The farcical case of *Moore v. Regents of the University of California* emphasizes that point. John Moore received treatment for hairy-cell leukemia at the University

²⁴²42 U.S.C. § 300gg-53(a)(1); Alaska Stat. § 18.13.010(a)(1) (2007); Ariz. Rev. Stat. Ann. § 20-448.02 (2002); Fla. Stat. Ann. § ___; Ga. Code Ann. § 33-54-3(b) (West 2003); Mass. Gen. Laws Ann. ch. 111, § 70G(c) (West 2003); Mich. Comp. Laws Ann. §§ 333.17020, 333.17520 (West 2008); Neb. Rev. Stat. § 71-551 (Supp. 2007); N.Y. Civ. Rights §79-1(2)(a) (McKinney Supp. 2008); S.C. Code Ann. § 38-93-40 (2002); S.D. Codified Laws § 34-14-21 to -22 (2004); Vt. Stat. Ann. tit. 18, § 9332(d) (2007).

²⁴³ National Conference of State Legislatures, State Genetic Privacy Laws (*available at*: <http://www.ncsl.org/programs/health/genetics/prt.htm>) (last visited on Aug. 2, 2009).

²⁴⁴ Sonia M. Suter, *Disentangling Privacy from Property: Toward a Deeper Understanding of Genetic Privacy*, 72 Geo. Wash. L. Rev. 737, (1997).

of California-Los Angeles (“UCLA”) Medical Center.²⁴⁵ During the course of treatment, Moore's spleen was removed and preserved by the medical staff. Researchers at UCLA then used portions of Moore's spleen to develop a revolutionary cell line from his lymphokines (substances secreted by cells of the immune system). Using Moore's lymphokines as a model, the researchers were able to synthetically reproduce them for mass production.²⁴⁶ UCLA obtained a patent on the cell line, listing Moore's physician as the inventor. While the researchers and UCLA received only an initial payment from a private-sector developer, no one, including Moore's physician, ever informed him that his cells were used to generate profitable medical technology.²⁴⁷

Moore eventually learned about the use of his cell lines and he sued UCLA and his physician, alleging, *inter alia*, a violation of his property rights in his genetic material. Moore bootstrapped his ownership argument to his right to privacy.²⁴⁸ The California Supreme Court rejected Moore's claims, and held that the genetic material could not be “unique” to the plaintiff.²⁴⁹ Because Moore's lymphokines have the same basic molecular structure as any other person's lymphokines, Moore had neither a property nor a privacy interest in his cells.²⁵⁰

Standing alone, the *Moore* case is a bit of charade that avoids forcing “round pegs of ‘privacy’ and ‘dignity’ into the square hole of ‘property.’”²⁵¹ While our personal sensibilities may be disturbed by the trade of genetic information on a biological commodity exchange, the court failed to find offense. *Moore* unfortunately makes obvious that individuals have no control over their genetic profile – and no property right or privacy right can create that control.

²⁴⁵ *Moore v. Regents of the Univ. of Cal.*, 793 P.2d 479, 481 (Cal. 1990).

²⁴⁶ *Id.*

²⁴⁷ *Id.* at 485-90.

²⁴⁸ *Id.* at 490-91.

²⁴⁹ *Id.*

²⁵⁰ *Id.*

²⁵¹ *Id.* 492.

Similarly, in the confines of familial DNA searches, there is no control over the use of the DNA profile.

As the foregoing demonstrates, the use of existing privacy provisions found in constitutions, statutes, and common law is unlikely to merit sympathy from a court. In short, a privacy claim is a weak avenue for a target to pursue.

B. Searching for Scions

With independent privacy rights all but a blip on the radar screen, the next level of inquiry examines the traditional Fourth Amendment analysis, which also implicates privacy concerns. The Fourth Amendment to the U.S. Constitution provides a right “of the people to be secure in their persons, houses, papers, and effects, against unreasonable searches and seizures.”²⁵² A Fourth Amendment challenge triggers two fundamental questions: First, does the challenged action constitute a search or seizure by the government (federal, state, or local) that implicates the Fourth Amendment? Second, if so, is the search or seizure “reasonable”?²⁵³

A Fourth Amendment right depends on whether the claim challenges the questioned conduct as a search or a seizure. The latter generally involves interference with a property right (items seized by the government) or restriction on movement (being arrested).²⁵⁴ On the other hand, searches interfere with the privacy of a person. A Fourth Amendment search occurs when government action interferes with an individual’s “reasonable expectation of privacy.”²⁵⁵ To have a reasonable expectation of privacy, the person must have both a subjective expectation of

²⁵² U.S. Const. amend. IV, § 2.

²⁵³ *Mapp v. Ohio*, 367 U.S. 643, 655 (1961).

²⁵⁴ *Michigan v. Summers*, 452 U.S. 692, 696 (1981).

²⁵⁵ *Kyllo v. United States*, 533 U.S. 27, 34 (2001).

privacy in the object of the search *and* that expectation is one that society recognizes as reasonable.²⁵⁶

Once the questioned conduct falls under the purview of the Fourth Amendment, the government generally must have probable cause and obtain a warrant in order to execute the search or seizure.²⁵⁷ In the normal setting, the taking of blood or other bodily fluids gives rise to a *prima facie* expectation of privacy, which is in contrast to other potential sources of identification, such as being asked your name.²⁵⁸ Because of this, offenders have challenged the relevant state or federal DNA collection statutes. As with the independent right of privacy, however, no challenge had been lodged against familial DNA searches. With no precedent for guidance, the outcome of such a challenge perhaps can be predicted through the eyes of current case law.

²⁵⁶ *Id.*

²⁵⁷ *Id.*; see also *Immig. & Naturalization Serv. v. Delgado*, 466 U.S. 210, 216 (1984). Exigent circumstances may relieve the government of one both, however.

²⁵⁸ *Skinner v. Ry. Labor Executives' Ass'n*, 489 U.S. 602, 616 (1989). In dicta, the Supreme Court has recognized that fingerprinting qualifies as a search. See *Hayes v. Florida*, 470 U.S. 811, 814 (1985). *But see* 26 Cardozo L. R. 1867, 1889 n.111 (collecting cases); *Dard v. Mississippi*, 392 U.S. 721 (1969).

1. Name, Rank, and DNA

Although the collection of DNA falls within the confines of Fourth Amendment protections, federal and state statutes authorizing the collection of DNA samples from felons and arrestees have mostly withstood a barrage of Fourth Amendment challenges because they fall under exceptions to the warrant requirement. Simply put, the state does not need probable cause to compel DNA samples from convicted offenders.²⁵⁹ In fact, convicted offenders are deemed to have a reduced expectation of privacy in their genetic information, whereas the general (non-offender) public enjoys the full protections of the Fourth Amendment.²⁶⁰ Consequently, the mandatory collection of DNA from convicted offenders (the state interest) outweighs the individuals' diminished expectation of privacy.

No case has yet made its way to the Supreme Court, but the federal DNA Act and its State law analogues have survived Fourth Amendment scrutiny in all the circuits except the Federal Circuit (which has not yet encountered such a case). From these cases, it is clear that courts continue to condone an ever-widening list of circumstances where mandatory, non-consensual DNA testing is permissible.

In the context of statutory DNA collection, Fourth Amendment jurisprudence takes one of two approaches, either a reasonableness/totally of the circumstances analysis or a special needs assessment. While the Circuit Courts of Appeal are unanimous that DNA collection statutes pass constitutional muster, they are split on which test to apply. The Second and Seventh Circuits have applied a special-needs analysis.²⁶¹ In contrast, a majority of the circuits – the First, Third, Fourth, Fifth, Eighth, Ninth, Tenth, Eleventh, and District of Columbia – apply a

²⁵⁹ *United States v. Kincaid*, 379 F. 3d 813, 839 (9th Cir. 2004).

²⁶⁰ *Id.*

²⁶¹ *See United States v. Hook*, 471 F.3d 766 (7th Cir. 2006); *Roe v. Marcotte*, 193 F.3d 72 (2d Cir. 1999).

reasonableness test informed by the totality of the circumstances.²⁶² The Sixth Circuit has applied both tests together.²⁶³ Before a conclusion can be drawn about the Fourth Amendment implications in familial DNA searching, it is necessary to examine the current state of the law as it applies in the most analogous situation – DNA collection from offenders.

It is well-settled that drawing blood constitutes a search, subject to the Fourth Amendment.²⁶⁴ Because drawing blood is a physical intrusion, it infringes upon the constitutional prohibition against unreasonable searches and seizures.²⁶⁵ The related DNA test to obtain a genetic profile is an additional invasion of that person's privacy rights.²⁶⁶ A somewhat less intrusive method is to take a swab of the cheek, and that too constitutes a search since it results in the development of a genetic profile, which is private information belonging to a person.²⁶⁷

As mentioned earlier, reasonableness is the cornerstone of the traditional Fourth Amendment analysis.²⁶⁸ In determining the constitutionality of a governmental search, the focus of the inquiry is on the reasonableness of the search in light of all circumstances surrounding the search in question.²⁶⁹ Usually, the search is evaluated by “balancing its intrusion on the individual's Fourth Amendment interests against its promotion of legitimate governmental interests.”²⁷⁰ In the standard setting, the balance is struck by requiring a search warrant based on

²⁶² See *United States v. Stewart*, 532 F.3d 32, 34 (1st Cir. 2008); *Banks v. United States*, 490 F.3d 1178 (10th Cir. 2007); *United States v. Kraklio*, 451 F.3d 922, 924-25 (8th Cir. 2006); *Johnson v. Quander*, 440 F.3d 489, 496 (D.C. Cir. 2006); *United States v. Sczubelek*, 402 F.3d 175, 184 (3d Cir. 2005); *Padgett v. Donald*, 401 F.3d 1273, 1280 (11th Cir. 2005); *United States v. Kincade*, 379 F.3d 813 (9th Cir. 2004); *Groceman v. U.S. Dep't of Justice*, 354 F.3d 411 (5th Cir. 2004); *Jones v. Murray*, 962 F.2d 302 (4th Cir. 1992).

²⁶³ See *United States v. Conley*, 453 F.3d 674, 674, 680-681 (6th Cir. 2006).

²⁶⁴ See *Skinner v. Railway Labor Executives' Ass'n*, 489 U.S. 602, 616, 109 S.Ct. 1402, 103 L.Ed.2d 639 (1989) (“A ‘compelled intrusio[n] into the body for blood’... must be deemed a Fourth Amendment search.”).

²⁶⁵ *Id.*

²⁶⁶ *Id.*

²⁶⁷ *Nicholas v. Goord*, 430 F.3d 652, 656 n. 5 (2d Cir.2005).

²⁶⁸ *United States v. Knights*, 534 U.S. 112, 118, 122 S.Ct. 587, 151 L.Ed.2d 497 (2001).

²⁶⁹ *Skinner*, 489 U.S. At 619.

²⁷⁰ *Id.*

probable cause.²⁷¹ Nonetheless, “neither a warrant nor probable cause, nor, indeed, any measure of individualized suspicion is an indispensable component of reasonableness in every circumstance.”²⁷²

The Supreme Court has recognized a special-needs exception to the typical warrant and probable cause requirements, which dispenses with the requirement of individualized suspicion in certain instances.²⁷³ “When faced with such special needs, we have not hesitated to balance the governmental and privacy interests to assess the practicality of the warrant and probable-cause requirements in the particular context.”²⁷⁴ Under this doctrine, suspicionless searches are carefully scrutinized and held constitutional only when they serve a “valid special need divorced from law enforcement objectives.”²⁷⁵ So, in the context of DNA collection statutes, courts express the view that DNA collection statutes are not unreasonable searches and seizures in violation of the Fourth Amendment.

For example, in *Roe v. Marcotte*,²⁷⁶ the court held that the Connecticut statute requiring convicted sex offenders to submit a blood sample for analysis and inclusion in the state's DNA data bank did not violate the Fourth Amendment's mandate against unreasonable searches. The state had a significant interest in *special needs* beyond law enforcement, in the form of solving past and future crimes and deterring crimes, outweighed the offenders' interest in avoiding the intrusion of having a blood sample drawn, which was a minimal interest.²⁷⁷ Ultimately, the

²⁷¹*Id.*

²⁷²*Nat'l Treasury Employees Union v. Von Raab*, 489 U.S. 656, 665 (1989); *Skinner*, 489 U.S. at 619 (“A showing of individualized suspicion is not a constitutional floor, below which a search must be presumed unreasonable.”).

²⁷³ See *Griffin v. Wisconsin*, 483 U.S. 868, 872 (1987) (“[W]e have permitted exceptions when ‘special needs, beyond the normal need for law enforcement, make the warrant and probable-cause requirement impracticable.’ ”).

²⁷⁴*Skinner*, 489 U.S. At 619.

²⁷⁵ See *City of Indianapolis v. Edmond*, 531 U.S. 32, 41, 121 S.Ct. 447, 148 L.Ed.2d 333 (2000) (stating that permitting suspicionless searches to be justified by general interest in crime control would allow such intrusions to become routine part of American life).

²⁷⁶*Roe v. Marcotte*, 193 F.3d 72 (2d Cir. 1999).

²⁷⁷*Id.* at 78.

combination of studies submitted by the state that indicated a high rate of recidivism among sexual offenders, and the value of DNA evidence in solving such crimes persuaded the court that the statute passes the “special needs” balancing test.

An alternative, and less rigorous, approach to Fourth Amendment analysis assesses the “totality of the circumstances” analysis. It does not require identifying a “special need;” instead, with respect to DNA collection statutes, courts evaluate the totality of the circumstances by balancing the degree to which the compulsion of DNA samples interferes with the privacy interests of the offender against the significance of the public interests served by such procedures.²⁷⁸

In *Rise v. State of Oregon*, the court took extra steps to distinguish the privacy rights of prisoners from those of “free persons.”²⁷⁹ The court held that the Oregon statute that required offenders convicted of certain violent felonies to submit a blood sample for inclusion in the state DNA databank did not constitute an unreasonable search and seizure under the Fourth Amendment.²⁸⁰ Since there was only a minimal intrusion at issue, the court balanced the significance of the public interest served by the creation of the DNA databank, whether the databank would serve the public interest, against the intrusion on individual liberties brought about by the blood test.²⁸¹

Once again, the state produced highly persuasive evidence demonstrating the high rates of recidivism among the types of offenders subject to the DNA statute, and the court took note that such offenses were likely to yield DNA evidence that could assist in solving crimes.²⁸² Thus, the court concluded that the genetic profiles generated from the blood samples would help

²⁷⁸ *United States v. Knights*, 534 U.S. 112, 118 (2001).

²⁷⁹ *Rise v. State of Oregon*, 59 F.3d 1556, 1560 (9th Cir. 1995)

²⁸⁰ *Id.*

²⁸¹ *Id.* at 1560-61.

²⁸² *Id.*

identify perpetrators and solve future cases.²⁸³ In addition to it being a resource for future criminal investigations, the court also explained that the DNA databank would help prevent wrongful convictions²⁸⁴ – a justification that is apparently gaining some popularity among the courts.

The court also viewed the DNA collection statute as being “evenhanded[,]” it applied to all persons convicted of the predicate offenses – thus there is no arbitrariness in its mandatory function.²⁸⁵ All of the factors, taken in total, reduced the offenders' expectations of privacy.²⁸⁶ The blood samples' minimal intrusion into the offenders' privacy interests were significantly subordinate to the public interest in preventing recidivism and solving violent crimes.²⁸⁷

As both the *Rise* and *Roe* cases demonstrate, regardless of method, the often one-sided teeter-totter between the state interest and the individual interest often leads to the same result.²⁸⁸ Both approaches consider the invasiveness of the procedure, the offender's reduced expectation of privacy, the overriding interest in public safety, and the unique nature and reliability of DNA as evidence of identity.²⁸⁹ The factors generally lead to a foregone conclusion that DNA collection statutes are constitutional.

How does this frame the Fourth Amendment inquiry for familial DNA searches? While the issue of familial DNA searches is unmarked territory, there is reason to speculate that it too

²⁸³*Id.* at 1561-62.

²⁸⁴*Id.*

²⁸⁵*Id.* at 1561.

²⁸⁶*Id.*

²⁸⁷*Id.*

²⁸⁸Duncan Carlin, *Less Privacy Please, We're British: Investigating Crime with DNA in the U.K. and the U.S.*, 31 *Hastings Int'l & Comp. L. Rev.* 487 498-99 (2008).

²⁸⁹*Id.*

would pass Fourth Amendment scrutiny as applied to both the pivot and the target.²⁹⁰ In both cases, the critical component to be considered is probable cause.

2. Pining for a Pivot

While it is unlikely that a pivot could challenge the generalized database trawls used to isolate similar profiles, a Fourth Amendment analysis seems appropriate where an investigator requests the identity of a pivot after a partial or familial match has been found. As its name suggests, familial searching involves a search of the genetic identity and profile of pivot, but is this any different from the search of a license plate or fingerprint database? Legally speaking, it's a tenuous argument to make if examined through a, objective lens that views DNA database searches as nothing more than combing through available data. Even though courts routinely find that offenders have minimal interest in their genetic information after conviction, the situation here has nothing to do with the reasons surrounding the offender's conviction. The disclosure of the pivot person's identity to investigate a crime that he is innocent of should require a showing of probable cause (or something close to it) that there is a likelihood that the pivot is related to the source.²⁹¹ The express guidelines of the few states that permit familial searching (or partial matches) seem to satisfy the strictures of probable cause. For example, in California, in addition to the source and pivot having at least 15 alleles in common, the following conditions must be met before the name of the pivot will be released:

- 1) A written request sent to the Chief of the Bureau of Forensic Services that describes the case, and attests that all other investigative leads have been exhausted, and a commitment to further investigate the case if the name of an offender is eventually released;
- 2) The crime scene profile is a single-source profile;

²⁹⁰Scott Michels, *Using a Relative's DNA to Catch Criminals* (Aug. 3, 2006) (available at: <http://www.usnews.com/news/articles/060803/3data.htm>)(last visited on Aug.1, 2009).

²⁹¹ *Kohler v. Englade*, 470 F.3d 1104 (5th Cir. 2006) (court held that search warrant for DNA evidence lacked probable cause; two anonymous tips and no corroboration does not amount to probable cause).

- 3) Y-STR typing of the same crime scene evidence that yielded the submitted forensic unknown profile has been completed by the submitting agency prior to the search;²⁹²
- 4) The CODIS search must result in a manageable number of candidates;
- 5) The candidate matches resulting from the modified CODIS search will be prioritized by DOJ using appropriate statistical calculations for relatedness;
- 6) Based on this prioritization, DOJ will conduct Y-STR analysis of the offender sample(s);
- 7) If the Y-STR profiles of the evidence and offender sample(s) are consistent, DOJ will review non-forensic information in order to identify additional evidence bearing on relatedness, if available;
- 8) A DOJ committee will discuss the case with the local law enforcement agency, the local laboratory, and the prosecutor's office. After reviewing all of the available information, the offender's name will be released unless there is a reason not to release it; and
- 9) If the committee cannot reach consensus, the decision to release the name to the investigating agency will be made by the Attorney General or his designee.²⁹³

In effect, California has codified the probable cause guidelines that would result in release of the pivot's name. Other states have guidelines as to the required amount of common alleles, but have yet to clarify such policies to the extent that California has. In Virginia, the partial match needs to "be very, very close" before the identity will be released to authorities.²⁹⁴ It remains to be seen what precisely constitutes "very, very close." On the other hand, Florida quantified its requirement of 21 of 26 alleles in common between the source and the pivot before the pivot's name is disclosed.²⁹⁵ Florida claims to have solved at least eight sexual assault cases using familial searching.²⁹⁶

There is no uniform amount of common alleles that can be said to meet what would be considered probable cause, as evidenced by Virginia's loose terminology. Nonetheless, a court

²⁹² Y-STR, or Y Chromosome Short Tandem Repeats are found only on the male-specific, Y chromosome. The Y chromosome is inherited through the paternal line and remains virtually unchanged through many generations. By examining specific locations on the Y chromosome, a Y-STR profile can be generated for each male tested. Males who are related through their fathers will tend to have the same or similar Y-STR profiles, and males who are not related will likely have different Y-STR profiles. DNA Identity Testing Center, Y Chromosome Test (Male Specific) (available at: http://www.800dnaexam.com/chromosome_test.aspx)(last visited on Aug. 1, 2009).

²⁹³ See Partial Match Memorandum, *supra* note 177, at 2.

²⁹⁴ Kimberly A. Wah, *supra* note 146, at 928.

²⁹⁵ *Id.*

²⁹⁶ *Id.*

would likely find that Y-STR testing (in the case of male source and pivot) coupled with a minimum agreement between alleles would satisfy a probable cause requirement. Moreover, here, it is not a question of probable cause that the pivot committed a crime. Rather, the applicable definition of probable cause in this context “a reasonable amount of suspicion, supported by circumstances sufficiently strong to justify a prudent and cautious person's belief that certain facts are probably true.”²⁹⁷ The facts at issue relate to kinship between source and pivot. Nonetheless, a court has yet to hold that probable cause is even required for release of the pivot’s identity, but under even that strict threshold, investigators can reach the name.

A pivot might also challenge being questioned by authorities once his name has been disclosed, but a court is apt to dismiss such a claim. Probable cause is not a relevant yardstick in this context. The Supreme Court has ruled that questioning related to identity or a request for identification by the police does not, standing alone, constitute a Fourth Amendment seizure such that probable cause would be required.²⁹⁸ In fact, if a pivot so chooses, he or she can refuse to answer investigators’ questions.²⁹⁹ Only if the encounter with authorities rises to level where the pivot believes that he may not voluntarily refuse or leave, is the Fourth Amendment activated.³⁰⁰ Without more, police may question a pivot about his family members.

3. Bombarding the Bull’s Eye

A murkier subject is whether or not a familial search could give rise to probable cause such that the government could compel a DNA sample from a target. Clearly, the law in this area is a complete vacuum. The case of *Kohler v. Englade*³⁰¹ is instructive, however. In 2001, a

²⁹⁷ J.G. Handler, *BALLENTINE'S LAW DICTIONARY* 431 (Delmar Publishers 1994).

²⁹⁸ *Fla. v. Royer*, 460 U.S. 491, 501 (1983).

²⁹⁹ *Delgado*, 466 U.S. at 216-17 (citing *U.S. v. Mendenhall*, 446 U.S. 544, 554 (1980)).

³⁰⁰ *Id.* at 216-17 (citing *Mendenhall*, 446 U.S. at 554).

³⁰¹ *Kohler v. Englade*, 470 F.3d 1104 (5th Cir. 2006).

serial killer kept raped and killed women in Baton Rouge, Louisiana.³⁰² The surrounding investigation included an FBI profile of the suspect and a task force tip line for the public to call.³⁰³ In addition to the profile, crime scene evidence revealed the killer's shoe size and, more importantly, genetic profile.³⁰⁴ Based on calls received from the tip line, investigators contacted more than 600 men as possible suspects.³⁰⁵

Eventually, the task force received two separate anonymous tips claiming that Shannon Kohler was the perpetrator.³⁰⁶ Kohler had a twenty-year-old burglary conviction, and fit some of the attributes of the FBI profile.³⁰⁷ Kohler fit the profile in that he was unemployed, had worked as a welder, and had worked on the same street where a victim's cellular phone was abandoned.³⁰⁸ At the investigators' request, Kohler initially agreed to provide a DNA sample, but later reneged.³⁰⁹ Kohler also had a shoe size of thirteen, which was different from the suspected shoe size of the killer – ten or eleven.³¹⁰

After Kohler refused to voluntarily provide a saliva swab for his DNA, police secured a warrant to compel a sample.³¹¹ Because of the warrant, Kohler submitted to an oral saliva swab, and within one day, the media identified him as a suspect in the investigation.³¹² More than two months later, Kohler learned from a local newspaper that authorities had cleared him as a suspect because his DNA did not match the killer's.³¹³ Kohler filed a Section 1983 action against the

³⁰² *Id.* at 1106.

³⁰³ *Id.* at 1106-1107.

³⁰⁴ *Id.*

³⁰⁵ *Id.*

³⁰⁶ *Id.*

³⁰⁷ *Id.*

³⁰⁸ *Id.*

³⁰⁹ *Id.*

³¹⁰ *Id.*

³¹¹ *Id.*

³¹² *Id.* at 1107-08.

³¹³ *Id.*

City of Baton Rouge and the officer who obtained the warrant for violating his Fourth Amendment rights.³¹⁴

Somewhat unpredictably, the Fifth Circuit agreed with Kohler, and held that, “Probable cause exists when there are reasonably trustworthy facts which, given the totality of the circumstances, are sufficient to lead a prudent person to believe that the items sought constitute fruits, instrumentalities, or evidence of a crime.”³¹⁵ The court took particular issue with the affidavit in support of the warrant that articulated the following: (a) Kohler was one of fifteen men out of six hundred who refused to give a DNA sample; (b) the task force received two tips from different people that Kohler was a possible suspect; (c) Kohler was a convicted felon; (d) Kohler used to be a welder for a company with a shop on Choctaw Drive; (e) a cell phone taken from one of the victims was found on Choctaw Drive; and (f) Kohler was currently unemployed.³¹⁶ The affidavit did not include, however, any reference to the FBI profile.³¹⁷

In finding a lack of probable cause, the court first observed “An anonymous tip, standing alone, is rarely sufficient to provide probable cause for a warrant.”³¹⁸ Police in this case failed to corroborate the tips, nor did they explain the relevance of Kohler’s employment status in relation to the murders.³¹⁹ The court found the link between Kohler’s prior employment on the same road where the cell phone was found as tenuous at best. Moreover, the twenty-year-old burglary conviction was hardly relevant (or probative) in a case where the perpetrator is a serial murderer

³¹⁴ *Id.*

³¹⁵ *Id.* at 1109.

³¹⁶ *Id.* at 1108-11

³¹⁷ *Id.*

³¹⁸ *Id.* at 1111.

³¹⁹ *Id.* at 1110-12.

and rapist.³²⁰ Ultimately, the court concluded that on the whole, the circumstances “failed to provide a nexus between Kohler's DNA and the serial killings.”³²¹

The *Kohler* opinion is instructive in the sense that in order to compel a target to submit a DNA sample there needs to be a “nexus” between the target and the source. There needs to be corroborating information beyond the familial search. That in and of itself will be a challenge with familial searches. Investigators should view the results of a familial search as an important lead that requires more legwork. The danger is that police would interpret a familial DNA hit as “**Do Not Acquit.” Meaning, they would take a lackadaisical approach to the investigation, and assume that the DNA will win the conviction on its own. *Kohler* makes clear that such assumptions do not pass Fourth Amendment scrutiny – authorities are still obligated to investigate the lead and generate corroborating evidence before they seek a DNA sample.**

Law enforcement aside, public (and juror) perception is often that the presence of DNA at a crime scene is an indicator of guilt. DNA at a crime scene, however, potentially answers only two questions: *What* is the evidence? *Who* does the DNA belong to? DNA does not address *when* the sample was deposited, *why* it was deposited, or *how* it was deposited. A testable DNA sample could be left at a scene through normal, non-criminal activity any time prior to the crime.

While the compulsion of DNA samples is the most radical outcome of a familial search, the more likely (and milder) outcome is that a target might be subjected to questioning by the police, as a means of corroborating that the target is the source such that a DNA sample would be warranted. In that instance, the analysis is the same as it is for the pivot. Targets do not lose

³²⁰ *Id.*

³²¹ *Id.* at 1111.

their Fourth Amendment protections by virtue of being related to a pivot.³²² Just as with a pivot, a target has the absolute right to refuse to speak with investigators. Routine questioning, without more, does not amount to a seizure under the Fourth Amendment.

4. Oops, You Dropped Your DNA

While much can be made about the ability of the state to compel a target to provide a DNA sample, there is nothing that prevents law enforcement from obtaining biological material “left behind” by a target in the course of a day. The BTK case highlights this. Dennis Rader’s daughter visited a doctor on her college campus for a routine pap smear. Unbeknownst to the daughter, investigators could seize DNA from the tissue sample obtained during the exam.³²³ They did not need her permission (although the Family Educational Rights and Privacy Act requires a court order before law enforcement may access a student's health data).³²⁴ Even the more mundane activities – drinking a soda, chewing gum, throwing away a toothbrush – allow investigators to acquire DNA samples without probable cause.

The simple truth is that people leave microscopic deposits of the DNA everywhere.³²⁵ Because of the abundance and availability of this free DNA, law enforcement is often permitted, without restriction, to obtain the DNA left behind by person they suspect of committing a crime.³²⁶ The debate over the constitutionality of this practice is an altogether different subject, but it bears mentioning since even if the police lack probable cause that a target is indeed the source of a profile in the forensic index, there are other means available to obtain that person’s DNA.

³²² *United States v. Kincaid*, 379 F.3d 813, 835 (9th Cir. 2004).

³²³ Nakashima, *supra*, note 7. An exception in the Family Educational Rights and Privacy Act allows law enforcement to obtain a student's health data with a court order. *Id.* HIPAA contains a similar exception for law enforcement purposes. 45 C.F.R. § 164.512(f) (2008).

³²⁴ *Id.*

³²⁵ Joh, *supra* note 102, at 858.

³²⁶ *Id.*

To summarize the relevant privacy and Fourth Amendment questions, the realistic outcome is that familial searching techniques, as applied to both pivots and targets, will prevail. To be sure, familial searching and its associated issues warrant at least a Fourth Amendment analysis in certain respects. But, the ultimate result, given the overriding public interest in crime prevention and resolution, will be to hold that such practices are constitutionally valid. The larger debate and where careful input is needed is in regard to the ethical issues posed by familial searches, rather than the legality.

IV. The Family Trust: Ethics and Accountability

Often, the initial reaction of to the implementation of intrusive measures such as familial searches is to find legal barriers that will either diminish or neutralize the threat. As discussed above, traditional legal limits lack the stringency to make a demonstrable dent in the adoption of familial searching policies. When the state of Maryland expressly rejected familial searches, it was more so out of political pressure than constitutional misgivings or scientific uncertainty.³²⁷ Familial searching is likely to be part of the crime fighting tools of the future, and it probably is here to stay in some form or another. The challenge thus becomes one of creating policies that allow the technology to proceed, but at a measured pace and in a principled manner. This section identifies and critiques some of the ethical and political alarms that have been (or should be) raised, and, finally, makes recommendations on the procedures and protections associated with familial searches.

A. The DNA of Dysfunction

The basis for familial searching is that related persons have related DNA. It does not take a quixotic leap to see that we resemble our family members in appearance, mannerisms, and personalities. These observable marks of inheritance create assumptions about behaviors being shared along genetic lines. Such assumptions have led some scholars to conclude that familial searching will either contribute to or be the product of the theory that criminality runs in families.³²⁸ According to the most ardent supporters of familial searching, research suggests that “there is a strong tendency for criminal behavior to cluster in families. As a result, the near

³²⁷ Need cite

³²⁸ See Haimes, *supra* note 138, at 270.

relatives of those in DNA databases are at a relatively high risk to commit crime.”³²⁹ Opponents of this reasoning fire back that criminality in families is an environmental rather than genetic condition since “families tend to live in the same area, and...offenders tend to offend close to their homes or in areas that they frequently visit.”³³⁰

It is questionable whether either view – criminality embedded in genetics or in the external environment – justifies or derails the use of familial searching. These models, however, are neither new nor unique. From 1870 to 1920, the eugenics theory gained momentum in the United States on the premise that “socially problematic behaviors are inherited and can be reduced or eliminated by preventing the carriers of bad seeds from reproducing.”³³¹ The true disciples of this philosophy believed that social ills were rooted in the family gene pool.³³² Indeed, one theorist wrote that “poor heredity and intemperance were so inexplicably mixed, so interdependent that intemperance could lead to vice, crime, insanity, idiocy, pauperism...handed down to children and children’s children.”³³³ These ideas eventually culminated in proliferation of sterilization programs.³³⁴

The idea of filtering out the criminal “debris” continued as criminal anthropology became a popular biological theory from 1890 – 1910. Based on the premise that criminals physically embody their lot in life, criminal anthropology posits that a person is “born criminal” and

³²⁹ Lazar, *supra* note 211; *see also* B. Bramley, “Summary of the presentation from Dr. Bob Bramley, Custodian, National DNA Database,” Minutes of the Human Genetics Commission Plenary Meeting, February 11th, 2004 at <www.hgc.gov.uk> (last visited on Jul. 31, 2009).

³³⁰ Williams and Johnson, *supra* note 147, at 555.

³³¹ Nicole Hahn Rafter, *Creating Born Criminals 2* (University of Illinois Press 1997).

³³² *Id.* at 34.

³³³ *Id.*

³³⁴ *Id.*

exhibits ape-like, primitive characteristics visibly different from law abiding citizens.³³⁵ In other words, the “body must mirror moral capacity.”³³⁶

In some aspects, particularly punishment, eugenics and its sister movement, criminal anthropology, converged in their objectives: preventing criminals from breeding because they will only produce future miscreants.³³⁷ The cadre of prophylactic methods included marriage restrictions, forced sterilization, life sentences, and even death.³³⁸ By the middle of Twentieth Century, the overt aim of weeding out the undesirables from the gene pool met a legal roadblock. In *Skinner v. Oklahoma*, the Supreme Court ruled that compulsory sterilization could not be imposed as punishment for a crime.³³⁹

While there is no evidence that familial DNA searching will open a backdoor to a eugenics revival, the historic propensity to equate criminality with family inheritance demonstrates a need to proceed with caution.³⁴⁰ This is especially true since at least one study may lend empirical support to the “born criminal” attitude. A 1999 U.S. Department of Justice survey found that 46 percent of jail inmates had at least one close relative who had been incarcerated.³⁴¹ Whether criminality is attributed to corrupt genes or an inescapable environment, there is a danger that the increased use of family links to identify suspects might create a sort of criminal cicatrix on the family. In the film *Minority Report*, DNA predetermined a person’s propensity to commit a crime, which marked that individual for life.³⁴² Similarly, the notion that crime breeds in families puts a similar taint on persons related to a databased offender. Ultimately, opponents fear that innocent family members will encounter a lifetime of genetic

³³⁵ *Id.* at 110-112.

³³⁶ *Id.* at 110.

³³⁷ *Id.*

³³⁸ *Id.* at 112.

³³⁹ *Skinner v. Oklahoma*, 316 U.S. 535 (1942).

³⁴⁰ *See generally* Troy Duster, *Backdoor to Eugenics* (Routledge 1990).

³⁴¹ Nakashima, *supra* note 7.

³⁴² *Minority Report* (Twentieth Century-Fox Film Corporation, 2002).

surveillance.³⁴³ While this is perhaps the most radical (and unlikely) consequence of familial search policies, it merits consideration in the larger policy questions about how much government intrusion into our lives we will permit.

Related to the concern of identifying and stalking genetic crime families is the fear that increased familial searching will disproportionately identify and target minority groups, especially African Americans.³⁴⁴ By conservative estimates, African-Americans represent only thirteen percent of the U.S. population but constitute forty percent of the people convicted of felonies every year.³⁴⁵ As CODIS grows, so too does the number of African American profiles in the database. The proportional data indicates that more African Americans will fall under scrutiny with the implementation of familial DNA. One estimate holds that seventeen percent of African-American citizens could be identified through familial searches, while only four percent of the Caucasian population could be reached.³⁴⁶

On the one hand, such numbers indicate that, in its most fierce form, familial searching could make racial profiling tame and rather obsolete. On the other hand, however, these are not astonishing statistics. The criminal justice system itself reflects the same compositional bias. Because of this, familial searching will follow the same disproportionate path. Racial categories are already a factor in DNA profiling.³⁴⁷ Thus, it is doubtful that familial searching will exacerbate an existing problem.

The impact that familial searching may have on the family unit cannot be discounted, and must be considered on a case-by-case basis. It is imperative that investigators take sensitive

³⁴³ *Rosen, supra* note 141 (opining that familial searches were not intended by framers of the Constitution who were concerned about “corruption of blood,” where family members were financially punished for the crimes of their fathers).

³⁴⁴ *Id.*

³⁴⁵ *Id.*

³⁴⁶ Greely, *supra* note 20, at 259.

³⁴⁷ *Rosen, supra* note 141.

approaches when interacting with those subject to familial searching – both pivots and targets. The potential for disruption of family bonds – labeling crime families, revelations about the existence or absence of biological relationships, the anxiety over implicating unintentionally implicating family members in criminal activity (by way of DNA) – is considerable. The approach here must be careful and measured so as to avoid harm, especially harm that could be prevented.

B. Debunking the Junk

While the social ramifications of familial search policies cannot be discounted, they are secondary to more pressing issues over the use and potential abuse of genetic information. From testing forensic samples to establish identity to using genetic tests to discover the potential for disease, our genetic information is collected, tested, and retained for multiple reasons. Ostensibly, forensic DNA profiling differs from other genetic tests in that it achieves identification by way of junk DNA.³⁴⁸ By contrast, genetic testing is used to identify and isolate diagnostic information, including past, present, and future medical history. The CODIS markers are thought to hold no diagnostic information; their sole value lies in their use as identification tools. A crime lab may know your name based on your CODIS profile, but they won't know whether or not you carry the gene that causes breast cancer.

As technology advances, however, we learn more about our coding DNA *and* the junk DNA. As it turns out, that “extra baggage” might actually perform functions critical to the evolution of the human genome.³⁴⁹ Researchers now believe that the non-coding DNA markers (like the ones to generate a forensic profile) have the potential to be significant even if they are not within a

³⁴⁸ See Bilz, *supra* note 90, at 859.

³⁴⁹ *Saved By Junk DNA: Vital Role In The Evolution Of Human Genome*, ScienceDaily (May 30, 2009) (available at: <http://www.sciencedaily.com/releases/2009/05/090528203730.htm>) (last visited on Jun. 1, 2009).

specified gene-coding region.³⁵⁰ Some scholars suggest that it would be disingenuous to characterize junk DNA as tiny black holes in our genomic universe.³⁵¹ Others dispel the intrigue and innuendo, and describe the doomsday scenarios of abuse of CODIS information as “science fiction.”³⁵²

While each claim has its merits, one thing is obvious: the pace of advancement in DNA technology is taking it in directions that just a few years ago were science fiction. When confronted with cases of identity and age falsification by foreign recruiting prospects, Major League Baseball began to require that these promising players (and their parents) submit to genetic testing to verify age and identity.³⁵³ In August 2009, a Stanford engineer announced that he invented a new technology for decoding DNA that costs less than \$50,000.³⁵⁴ According to the inventor, that low cost “will democratize access to the fruits of the genome revolution” by enabling hospitals and even small labs to decode whole human genomes.³⁵⁵ Even the Federal Bureau of Investigation plans to take CODIS to the next level by utilizing mitochondrial DNA, Y-STR testing, and other “meta data” (including sex, last sighting, age, etc.) to help in the identification of criminals and missing persons.³⁵⁶

So, the notion that junk DNA may hold diagnostic information or evolutionary history is not a fairy tale. The question is whether the government or some other private entity will exploit the budding technology and its junk designation for nefarious purposes, such as gathering genetic information to hold as a bargaining chip or, taken to its extreme, framing an innocent person for

³⁵⁰ *Id.*

³⁵¹ Simon A. Cole, *Is the ‘Junk’ Designation Bunk?*, 102 Nw. U. L. Rev. Colloquy 54, 54 (2007).

³⁵² D. H. Kaye, *Science Fiction and Shed DNA*, 101 Nw. U. L. Rev. Colloquy 62, 63 (2006).

³⁵³ Michael S. Schmidt and Alan Schwarz, *Baseball’s Use of DNA Raises Questions*, N.Y. Times (July 22, 2009) (available at:

³⁵⁴ Nicolas Wade, *Cost of Decoding a Genome Is Lowered*, N.Y. Times (Aug. 11, 2009) (last visited on Aug. 11, 2009).

³⁵⁵ *Id.*

³⁵⁶ Federal Bureau of Investigation, *CODIS – The Future* (available at: <http://www.fbi.gov/hq/lab/html/codis4.htm>) (last visited on Aug. 1, 2009).

a crime.³⁵⁷ In that vein, there are federal and state laws in place that assess steep fines and/or criminal penalties for the unauthorized access, use and abuse of genetic information.³⁵⁸ In addition, the NDIS webpage, maintained by the FBI, contains a Privacy Act Notice specifies that the DNA profiles in the system are de-identified, meaning that personal identification information (such as the name of the person the profile belongs to) are not in that system.³⁵⁹ The point here is not to suggest that we are safe from a genetic incursion, but to point out the mere existence of safeguards. Such safeguards, however, require execution to be effective, and it remains to be seen if such laws will in fact protect our genetic information.

C. Meet the Creeps

Law makers and law enforcement have identified the benefits of the increasing use of DNA technology. In many ways, DNA evidence represents the easy way to solve a case. Undoubtedly, there is the potential to both make quick and thorough offender identifications via the database and remove the innocent from suspicion.³⁶⁰ In addition, the widely publicized use of databases and familial searches might have the dual effect of both deterring crime and boosting public confidence in the justice system.³⁶¹ All in all, DNA databases and familial searching appear capable and accomplished at executing their law enforcement purposes.

But, for all the advantages DNA databases provide in crime fighting, there should be just as many concerns. As originally designed, NDIS and its state counterparts (SDIS and LDIS) have

³⁵⁷ Scientists in Israel recently published test results where they were able to fabricate DNA evidence. Andrew Pollack, *DNA Evidence Can Be Fabricated, Scientists*, N.Y. Times D3 (Aug. 18, 2009). The scientists created unlimited amounts of “artificial” DNA with a genetic profile to match anyone or no one. *Id.* One might imagine that artificial DNA in the wrong hands may eventually find its way to crime scenes and evidence rooms. While there is no current evidence of crime scene engineering, the technology appears to be evolving faster than anticipated.

³⁵⁸ Natalie A. Bennett, *A Privacy Review of DNA Databases*, 4 I/S: J. L. & Pol’y for Info. Soc’y 821, 835 (Winter 2008-2009).

³⁵⁹ Federal Bureau of Investigation, Privacy Impact Assessment National DNA Index System February 24, 2004 (*available at*: <http://foia.fbi.gov/ndispia.htm>) (last visited on Aug. 1, 2009).

³⁶⁰ Bennett, *supra* note 362, at 827.

³⁶¹ *Id.*

missions of providing “an effective tool for solving violent crimes.”³⁶² This stated goal of solving violent crimes seems to have morphed considerably with the ever-expanding nature of DNA collection statutes, which now include arrestees, and offender convicted of non-violent felonies and even misdemeanors in some jurisdictions.³⁶³ In fact, the inclusion of arrestees in databases means that innocent citizens are, in effect, treated just like the guilty, which erodes the concept of innocent until proven guilty. Moreover, this contributes to the widely held notion that if a person manages to get arrested, he or she must have done something wrong.³⁶⁴ It creates a new category of criminality: “innocentish,” a purgatory of sorts where your genetic profile can be used against you and your family.³⁶⁵ The inclusion of arrestees or misdemeanor offenders arguably deviates from the initial purpose of the DNA database, at least the purpose that was sold to the public.

As the type of crime and the type of person included in a DNA database continues to grow, the government is quick to identify the statutory and regulatory firewalls that protect the CODIS profiles from clandestine capture. The larger threat, however, may be an internal one. It appears that the government may legally “license” such information in the name of research. 42 U.S.C. § 14136b, entitled DNA Research and Development, allows the Attorney General to make grants for research and development to “improve forensic DNA technology.”³⁶⁶ This research and development may include “increasing identification accuracy and efficacy” and evaluation of

³⁶² Federal Bureau of Investigation, CODIS Brochure (*available at* <http://www.fbi.gov/hq/lab/pdf/codisbrochure2.pdf>) (last visited on Aug. 6, 2009).

³⁶³ Brian Doherty, *Collecting DNA: Database Mission Creep*, Reason Magazine (June 2006) (*available at* <http://www.reason.com/news/show/36657.html>) (last visited on Aug. 1, 2009).

³⁶⁴ Anne Martinez, *Putting the Innocent Behind Bars*, USA Today (May 1995) (*available at* http://findarticles.com/p/articles/mi_m1272/is_n2600_v123/ai_16885413/) (last visited on Jul. 31, 2009).

³⁶⁵ Tom Sutcliff, *Innocentish: An Essential Part of Justice*, The Independent (May 12, 2009) (last visited on May 20, 2009).

³⁶⁶ 42 U.S.C. § 14136b(a) (2004).

“increased collection and use of DNA evidence.”³⁶⁷ This tiny addition in the larger DNA identification statutory framework could open the door to research of genetic profiles, and represents a government-endorsed intrusion into our genetic privacy.

As a consequence of all extracurricular activities sponsored by the CODIS program and the federal government's DNA Initiative, CODIS and its local and state progeny are proceeding down a path referred to as “mission creep.”³⁶⁸ Mission creep involves the expansion of a project beyond its original mission.³⁶⁹ Sir Alec Jeffries, the pioneer of DNA fingerprinting has misgivings about the fundamental change in the purpose of DNA databases: “When the database was initially established it was to database criminals so that if they reoffended they could be picked up. There are now hundreds of thousands of entirely innocent people now populating that database, people who have come to the police's attention as a result of being charged with a crime but subsequently released.”³⁷⁰

Between research interests and the burgeoning database population, familial DNA searches may become a secondary issue. Familial searches, however, represent yet another extension of the initial purpose of DNA databases. As Alec Jeffries noted, the databases (established with the technology he invented) were meant to identify *the* perpetrator who left the sample, not the family members of the perpetrator. If employed in a slapdash manner, familial searching has the ability to further increase the number of innocent people in the database.

As an illustration, imagine that investigators get a partial match to a crime scene sample that indicates that an offender – the pivot – likely has a brother who committed the crime. Further

³⁶⁷ 42 U.S.C. § 14136b(a)-(b) (2004).

³⁶⁸ *Alarm as Innocent People Fill DNA Database*, Daily Mail (Nov. 1, 2006) (available at: <http://www.dailymail.co.uk/news/article-413890/Alarm-innocent-people-DNA-database.html>) (last visited on June 2, 2009) (hereinafter “Alarm”).

³⁶⁹ Sheila Jasonoff, *DNA Fingerprinting and Civil Liberty*, 34 J.L. Med. & Ethics 328, 337 (2006).

³⁷⁰ *Alarm*, *supra* note 351.

DNA testing shows that the two single-donor samples share a common Y-STR profile. Investigators then discover that the pivot has five brothers. Even if only two of those brothers are deemed worthy of further investigation because of geographic proximity and other evidence, at least one, if not both, is innocent of the crime but may nonetheless remain in the database if arrested and his genetic profile and biological sample are added to the DNA hoard.

The retention of profiles and samples as a result of the increased familial searching policies is unsettling on some level, even if the precise opposition to it lacks definition. The vulnerability of genetic information from familial searches or other database expansion activities merits careful scrutiny. The reason is straightforward: to determine both the necessary boundaries (if any) for the collection and use of genetic information and the consequences related to any breach of those boundaries. At the very least, uniform guidelines would establish a base level from which to work. States store the majority of tissue samples and generate the attendant profiles, but while some state and federal regulations restrict access to and disclosure of information in DNA databases these standards lack uniformity and clarity.³⁷¹ Inconsistent and vague provisions regarding the management of genetic information may increase the likelihood that a government agency or commercial entity will access such information for purposes unrelated to public safety and law enforcement.³⁷²

Current federal and state practice requires criminal justice agencies to retain and store the biological samples from which genetic profiles are generated.³⁷³ Because of this, samples may be held indefinitely.³⁷⁴ This seems a coherent approach in the offender context since the actual

³⁷¹Bennett, *supra* note 64, at 830-31.

³⁷²*Id.*

³⁷³*Id.*

³⁷⁴*Id.*

biological sample may be needed later either to challenge or confirm a profile match.³⁷⁵ In the context of arrestees or individuals ensnared by a familial search, however, this approach lacks the same validity. First, the DNA profile and sample both should be purged from the system once it is determined that the individual is innocent of any crime. Second, while forensic DNA profiles are based on the junk DNA extracted from a sample, an entire genetic profile can be also be gleaned from the sample – including sensitive information. Third, because of the potential that additional genetic information can be gleaned from the biological samples, what obligation, if any, is owed by a lab that learns sensitive information about an individual (such as possessing a gene that has been known to cause cancer)? Without a doubt, as long as biological samples are stored in addition to the retention of the forensic DNA profile in the database, there is an opportunity for unauthorized parties to access that information for “malicious, retributive, or oppressive purposes.”³⁷⁶

Currently, there is no law requiring authorities to purge the biological samples and related profiles from a database once that person is no longer under suspicion.³⁷⁷ Indeed, when one voluntarily submits a DNA sample during the course of an investigation resulting from a familial search (or perhaps even providing a DNA sample when arrested), the retention of both the biological sample itself and the DNA fingerprint once that person is excluded as a suspect exceeds the scope of consent.³⁷⁸ Moreover, consent in the first instance is often compromised

³⁷⁵*Id.*

³⁷⁶*Id.*

³⁷⁷ While much was made of the passage of the Genetic Information Nondiscrimination Act (GINA), it lacks bravado. GINA only prohibits genetic discrimination in the confines of employment or health insurance coverage. P.L. 110-233, 122 Stat. 881 (2008). It does not prohibit the government from using genetic information collected and used in criminal investigations for purposes completely unrelated to the criminal justice system (such as population migration or geographic distribution of diseases). The lack of provisions expressly restricting the use of genetic information collected in the course of government investigations leaves a gaping hole that could facilitate a “mission creep” of the purpose of DNA databases that originally were maintained to assist law enforcement.

³⁷⁸ D.H. Kaye and Michael E. Smith, *DNA Databases: Legality, Legitimacy, and the Case for Population-Wide Coverage*, 2003 Wis. L. Rev. 413, 430 (2003).

since targets may feel pressured to surrender to a DNA test in order to prove his or her innocence. Purging the records is the only appropriate remedy to restore that person's autonomy and relieve them of the anxiety of being placed under genetic surveillance. There is international precedent for this practice. In December 2008, the European Court of Human Rights ordered the UK to purge the DNA records of hundreds of thousands of innocent people from its vast national database.³⁷⁹ The United States could take a cue and perhaps avoid a prolonged battle over the retention of DNA records of unconvicted persons.

Of course, the conversations about who is in and who is out of DNA databases would be rendered moot if calls for a universal database prevailed.³⁸⁰ Support for a universal system has gained momentum with the increasing volume of profiles in DNA databases. From public safety benefits to equalizing the criminal justice process across the races, there are some arguments to be made for the adoption of a population wide database.³⁸¹ As the debate on nationalized healthcare in the United States continues, a universal database may well be a product of that package – at least one country has attempted to centralize medical and genetic records. In 1999, Iceland pioneered the creation of a national database – DeCode – to maintain healthcare records and store genetic information.³⁸²

While trumpeted as an effective and easy way to administer and track health, social and other benefits, critics have raised serious concerns about genetic privacy, ethical treatment, informed consent, and genetic discrimination.³⁸³ DeCode was intended to give Iceland a global edge in

³⁷⁹Jill Lawless, *Britain to Purge National DNA Database*, San Francisco Chronicle (May 8, 2009) (available at <http://www.sfgate.com/cgi-bin/article.cgi?file=/c/a/2009/05/08/MNNV17GK2G.DTL>) (last visited on May 8, 2009).

³⁸⁰Kaye and Smith, *supra* note 360, at 437-459.

³⁸¹*Id.*

³⁸²Michael A. Fortune, *PROMISING GENOMICS: ICELAND AND DECODE GENETICS IN A WORLD OF SPECULATION* 132-135 (University of California Press 2008).

³⁸³*Id.* at 274.

medical research because of its isolated gene pool (little change since the days of Vikings).³⁸⁴ At the same time, however, DeCode was the birth child of a private, for-profit company that sought to create one of the most powerful drug companies in the world.³⁸⁵ And the biggest firestorm has spun around the Icelandic government's agreement with the purveyors of DeCode.³⁸⁶ In effect, Iceland's "government gave a single company monopoly control of the country's health records."³⁸⁷ Since 2000, more than 20,000 people have opted out of DeCode's plans over concerns of genetic exploitation.³⁸⁸ In the years since its inception, some scientists have called for an international scientific boycott of Iceland because of misgivings over genetic privacy and profiteering.³⁸⁹ Iceland aimed to be a petrie dish from which genetic opportunity could grow, but the rush to implement a one-size-fits-all database skipped an appraisal of the drawbacks.

From a simplistic perspective, DNA represents just another marker along the spectrum of identity components. At one end of the spectrum are broad observable classifications of gender, race, height, and body type. As identification techniques have progressed, the identifying attribute has become increasingly personalized: photographs, fingerprints, dental features, HLA tissue typing, and, finally, DNA. Does the increasing personal nature of identification amount to an increasing threat to privacy? While the use of genetic technology to apprehend criminals and even to advance health care prevention and treatment have gained credibility, Iceland's project serves as an example of the need to engage in public education and informed discussions since the level and amount of genetic harvesting causes concern and misgivings, of which Iceland, again, serves as the example.

³⁸⁴ Robin McKie, *Icelandic DNA Project Hit by Privacy Storm*, *The Observer* (May 16, 2004) (available at: <http://www.guardian.co.uk/science/2004/may/16/genetics.research>) (last visited on September 1, 2009).

³⁸⁵ *Id.*

³⁸⁶ *Id.*

³⁸⁷ *Id.*

³⁸⁸ *Id.*

³⁸⁹ *Id.*

In promoting its open government policy, the Obama administration has promised to have frank and candid dialogue with American citizens.³⁹⁰ Some honesty about the trajectory of genetic surveillance and databank prospects should be included in that conversation. From familial searches to genetic diagnoses, there should be concern and questions about the growth of the use of DNA. Many states have enacted protections against genetic discrimination in health insurance, employment, or both. These laws vary widely in scope and many are untested in court. State laws fail to provide uniform, ground-level protections in even employment and health insurance on which Americans can rely.³⁹¹

D. Family (Gene) Therapy

To malign the mining of genetic information without suggesting an alternative would be the same as complaining about the results of an election without having voted. Thus, this section completes the discussion of familial DNA searches by crafting an approach to administering such searches and managing the results. It is tempting to construct a collective ethical scheme that addresses all forms of genetic information, but that is not the import of this article. Moreover, ethical guidelines cannot be shaped into a “one-size-fits-all” model across the universe of genetics. Rather, each situation – familial searches, genome sequencing, etc. – requires particularized and careful controls that foster the development of scientific ingenuity and protect against the abuse of genetic information.

Thus, in terms of familial searching, the following policies should be implemented uniformly by jurisdictions that elect to perform such investigations. Included in this regime are provisions

³⁹⁰ The White House, Memorandum for the Heads of Executive Departments And Agencies re: Transparency and Open Government (*available at*: http://www.whitehouse.gov/the_press_office/TransparencyandOpenGovernment/) (last visited on Aug. 1, 2009).

³⁹¹ Genetic & Public Policy Center, U.S. Public Opinion on Uses of Genetic Information and Genetic Discrimination (Apr. 24, 2007) (*available at*: http://www.dnapolicy.org/resources/GINAPublic_Opinion_Genetic_Information_Discrimination.pdf) (last visited on Jul. 31, 2009).

for obtaining partial matches, instructions with regard to DNA samples of targets, and, importantly, a reciprocal right of access to familial searches for defendants asserting claims of actual innocence. These guidelines are necessary to inform individuals about the scope of the use of their genetic information by demanding clear definition from governmental authorities regarding collection, consent, and management of genetic information. Moreover, these guidelines discourage the reckless or madcap collection of DNA.

FAMILIAL DNA SEARCH PROCEDURES RELATED TO
THE RELEASE OF PERSONAL INFORMATION, COLLECTION OF
BIOLOGICAL SAMPLES; PROTECTION OF GENETIC INFORMATION;
RIGHT OF ACCESS IN CASES OF ACTUAL INNOCENCE

*Section 1: Procedures relating to familial search requests and release of offender information*³⁹²

- (a) Before a familial search of the database may be performed, the following criteria must be met and certified written request to the supervisor of [the state crime lab or other forensic entity]:
- (1) The forensic profile (the “forensic profile”) is a complete single-source profile, with values present at all 13 CODIS loci;
 - (2) The forensic profile was searched against the offender database for a perfect match, and returned no offender profile; and
 - (3) All other leads and attempts to identify the source have been exhausted.
- (b) The release of personal identifying information of any offender requires a written request sent to the [databank oversight panel],³⁹³ which includes all of the following:

³⁹² The provisions related to the familial search requests and offender information were drawn upon from the California partial DNA match protocol. Memorandum from Edmund G. Brown, Jr., Att’y Gen. of Cal. to All Cal. Law Enforcement Agencies and Dist. Att’y’s Offices, DNA Partial Match (Crime Scene DNA Profile to Offender) Policy (Apr. 25, 2008).

³⁹³ This provision contemplates the creation of an oversight panel that makes ethical and legal determinations with regard to DNA databases. The panel would consist of both scientists and legal experts who evaluate various procedures (such as familial DNA searches) and issue opinions and ultimately have authority to approve such searches. Practicality dictates that each state create its own oversight panel, but budget constraints could curtail that option. In February 2009, the National Research Council, as part of a study sponsored by the National Academy of Sciences, released a scathing report on the state of forensic science. The report called for the creation of a National Institute of Forensic Science (NIFS). “*Badly Fragmented*” *Forensic Science System Needs Overhaul; Evidence to Support Reliability of Many Techniques Is Lacking*, News From the National Academies (Feb. 18, 2009) (available at: <http://www8.nationalacademies.org/onpinews/newsitem.aspx?RecordID=12589>) (last visited on Jun. 1, 2009). Budget constraints, federal preemption, and efficacy issues aside, NIFS would be an ideal institute to house a national database oversight panel. Especially since databases by and large use the same software – CODIS.

- (1) Copy of the certified letter requesting the familial search and describing the details of the case;
 - (2) The moderate-stringency search results showing that one or more offender profiles share at least 16 STR alleles with a different but potentially related forensic profile;
 - (3) A kinship analysis of the forensic profile and offender profile;
 - (4) A comparison of the allele frequencies between the offender profile and forensic profile;
 - (5) Calculation of the likelihood ratio demonstrating the likelihood that the offender and source are related;
 - (6) Prioritization of offender profiles most likely related to the forensic profile; and
 - (7) If the forensic profile and offender(s) profile(s) both exhibit a Y-chromosome, Y-STR profiles that establish that the forensic and offender profiles are consistent.
- (c) The databank oversight panel will discuss the case with local law enforcement, forensic scientists familiar with the case, and any other advisory entity deemed necessary to make a decision.
- (d) If the databank oversight panel cannot come to a decision, the [state] Attorney General or an appropriate designee will determine the release of the offender's name.

*Section 2: Procedures Relating to the Collection of Biological Information from Individuals Identified Through Familial Searches*³⁹⁴

- (a) No DNA sample shall be obtained from any person in connection with the results of a familial DNA search without probable cause, a court order, or voluntary consent as described in subdivision (b) of this section;
- (b) In the absence of probable cause, if any person is requested by a law enforcement person, agency, or court to consent to the taking of a DNA sample in connection with an investigation of a particular crime, such consent shall be deemed voluntary only if:
- (1) The sample is knowingly and voluntarily given in connection with the investigation of a particular crime;
 - (2) The results of the familial search validate this person as a person of interest in the particular crime;
 - (3) The person was informed both verbally and in writing of the following:
 - (A) The purpose for which the sample will be used;
 - (B) The fact that the DNA sample may unintentionally reveal incidental medical, diagnostic, or other genetic information unknown to the person;
 - (C) The request may be refused and that such refusal does not supply probable cause or reasonable suspicion to believe that the person has committed a crime;

³⁹⁴ Provisions related to collection of biological samples used the Nebraska Neb. Rev. Stat. § 29-4126 (2006) as a model.

- (D) No threat, pressure, duress, or coercion of any kind was employed, whether (i) direct or indirect, (ii) express or implied, or (iii) physical or psychological;
- (4) The person signs the writing which contains the foregoing information.
- (c) Any DNA sample obtained in violation of this section is not admissible in any proceeding for any purpose whatsoever;
- (d) A person shall be notified in writing by the law enforcement agency immediately upon the determination that he or she has not been implicated by his or her DNA sample in the commission of the particular crime in connection with which the DNA sample was obtained;
- (e) Law enforcement shall also immediately destroy the DNA sample, the resulting profile, and all other identifying information related to that person; and will notify that person in writing when such action has been completed;
- (f) Any other personal property of such person shall be delivered to the person and within ten days after the notification required by subdivision (d) of this section with a written explanation that the materials are being turned over in compliance with this section;
- (g) The law enforcement agency shall purge all records, including, but not limited to, written, recorded, or electronic materials, and identifiable information pertaining to the person specified in subdivisions (d), (e), and (f) of this section;
- (h) No records of this person shall be transferred, shared, or otherwise provided to any national, state, county, or local law enforcement agency unless such person has been implicated in the particular case by his or her DNA sample;
- (i) Any incidental diagnostic, medical, or other genetic findings from the DNA test shall only be disclosed to the person after that his or her express written consent to such disclosure.
- (j) Any aggrieved person may file an against any person, including any law enforcement agency, to enjoin such person or law enforcement agency from violating this section; and
- (k) Any person aggrieved by a knowing violation of this section may bring an action in district court for damages. A person found by the court to be aggrieved by a violation of this section shall receive damages of not less than one thousand dollars and may recover reasonable costs and attorney's fees.

*Section 3: Procedures Relating to the Right of Access to Familial DNA Searches for Defendants with Claims of Actual Innocence*³⁹⁵

³⁹⁵ If familial searching is going to be used to locate the guilty, it should likewise exonerate the innocent. Indeed, as courts weigh the legality of DNA databases, one of the justifications is that databases have the power to exculpate and clear names. In North Carolina, familial DNA testing exonerated Darryl Hunt twenty-three years after he was

- (a) Reciprocal right of access. A Defendant challenging a conviction with a claim of actual innocence may make motion for a participating laboratory to perform a familial search. Such motion must be made under oath and include the following:
- (1) A statement of the facts relied upon in support of the motion, including a description of the case; the evidence presented in the case; and why familial DNA searching would assist in post-conviction process.
 - (2) A statement that the Defendant is innocent and a description of how postconviction familial DNA searching is relevant and necessary to his or her assertion of innocence;
 - (3) A statement as to why identity is an issue in the case;
 - (4) A statement of any other facts relevant to the motion; and
 - (5) A certification that a copy of the motion has been served on the prosecuting authority.
- (b) Should the court permit the familial DNA search, such search and any related investigation shall be performed in accordance with section 1 and 2, above.

V. Conclusion

Each new extension of the CODIS system, and its research-driven counterparts, brings us closer to a universal database. As technology continues to advance to include such practices as familial searching, forensic DNA collection is destined to intensify and expand. While the ability to solve crime, convict the guilty, and even exonerate the innocent is a commendable goal, the use of familial searches in criminal investigations necessitates vigilant and uniform guidelines for ethical investigative practice. As the lines between state and private access to DNA databases blur and converge, the above scheme is an effort to suggest rigorous and practical guidelines for investigators and researchers alike. Familial DNA searching is a certainty that cannot be avoided, but perhaps carefully drawn criteria for its application can stimulate further

convicted of murder. The crime scene profile was searched against the state database and returned a near match. The subsequent investigation led to the older brother of the offender who partially matched the crime scene evidence. As a result the real murderer, Willard Brown, confessed. Phoebe Zerwick, *Hunt Exonerated*, Winston-Salem Journal (Feb. 6, 2004) (*available at*: http://www.denverda.org/DNA_Documents/Familial_DNA/News%20Report%20re%20Brown.pdf) (last visited on Aug. 1, 2009).

conversation and meaningful change in our approach to the use bioinformation so as to avoid abuse.