DIMINISHED RETURNS: THE EXORBITANCE OF COLLECTING DNA FROM ALL ARRESTEES

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INTRODUCTION

In the film *Top Gun*, Maverick was a trained fighter pilot who was allowed to fly incredibly powerful planes despite his inability to consider the high probability of the potentially disastrous effects of his impetuous behavior.[1] Maverick consistently engaged in a stream of irrational decisions but somehow always ended up a hero.[2] In one of the scenes from the movie, Maverick flew out to help a fellow fighter pilot despite having a dangerously low tank of fuel and having received strict orders to fly back to base.[3] An empty tank of fuel would have destroyed the expensive plane by forcing an emergency landing into the ocean.[4] The huge risk was justified when the heroic gesture allowed both pilots to safely return to the base.[5] Upon arrival, Maverick was called into his superior's office and was strongly chastised for acting foolishly and continuing to fly despite the huge risk involved.[6] The superior said, "[w]hat you should have done was land the plane!"[7] He continued, "You don't own that plane, the taxpayers do! Son, your ego is writing checks your body can't cash."[8]

Like Maverick, law enforcement officials are incredibly empowered by technological advances.[9] DNA forensics allow law enforcement to have a forceful impact on criminals by effectively determining whether a person

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1. *See* TOP GUN (Paramount Pictures 1986).
2. *Id.*
3. *Id.*
4. *Id.*
5. *Id.*
6. *Id.*
7. TOP GUN, *supra* note 1.
8. *Id.*
9. Amitai Etzioni, *DNA Tests and Databases in Criminal Justice: Individual Rights and the Common Good*, *in* DNA AND THE CRIMINAL JUSTICE SYSTEM: THE TECHNOLOGY OF JUSTICE 197, 200 (David Lazer ed., 2004). Paul Ferrara, director of the DNA database program in Virginia, is a major proponent of DNA forensics. *Id.* Ferrara claims that DNA technology is transforming police investigations. *Id.* DNA technology is the most effective investigatory tool because it can accurately determine the identity of a suspect or help police narrow the search for a suspect. *Id.*

has ever been involved in any previously unsolved crime with the simple click of a mouse.[10] For example, a person arrested and charged with rape may have a criminal DNA profile created as a result of committing that offense.[11] If that genetic profile matches DNA found at the scene of an unsolved homicide, the DNA match alone can serve as sufficient justification to charge that person with homicide.[12] DNA forensics is a great technology that optimizes the efficiency in which law enforcement can catch criminals.[13] However, the future expansion of DNA databases is uncertain and heavily debated.[14]

In *Maryland v. King*,[15] the Supreme Court upheld a statute allowing the collection of DNA from arrestees who are charged with serious crimes.[16] In the dissenting opinion, Justice Scalia warned that the

10. *See generally Frequently Asked Questions (FAQs) on the CODIS Program and the National DNA Index System*, FED. BUREAU OF INVESTIGATION, http://www.fbi.gov/about-us/lab/biometric-analysis/codis/codis-and-ndis-fact-sheet (last visited Feb. 13, 2014) [hereinafter *FAQs on CODIS*]; U.S. DEP'T OF JUSTICE, OFFICE OF JUSTICE PROGRAMS, NCJ 194197, USING DNA TO SOLVE COLD CASES 10 (2002), https://www.ncjrs.gov/pdffiles1/nij/194197.pdf [hereinafter USING DNA TO SOLVE COLD CASES]. The Combined DNA Index System ("CODIS") is the general term used to refer to the national criminal justice DNA database. *FAQs on CODIS*, *supra*. CODIS consists of the National DNA Index System ("NDIS") and the software used to perform DNA searches. *Id.* The software searches two indexes for a potential DNA match. USING DNA TO SOLVE COLD CASES, *supra*. The first index is the offender index which includes DNA from individuals who have been charged or convicted of certain crimes. *Id.* The second index is known as the forensic index which includes samples found at crime scenes. *Id.* A match between DNA profiles in the forensic index indicates that separate crime scenes are related. *Id.* When a profile in the forensic index matches to a profile in the convicted offender index, the identity of a suspect is generated. *Id.*

11. *See* State v. Emerson, 981 N.E.2d 787, 789 (Ohio 2012). In *Emerson*, the defendant was found guilty of aggravated murder. *Id.* at 790. The defendant initially became a suspect to the murder when his DNA profile was matched with DNA found at the scene of the crime. *Id.* Years earlier, law enforcement had obtained a search warrant to collect the DNA of the defendant who had been accused of rape. *Id.* at 789. The defendant was eventually acquitted of the rape charge but did not expunge the DNA profile which remained in the database. *Id.*

12. *Id.* at 789–90.

13. Etzioni, *supra* note 9.

14. *Compare* D.H. Kaye & Michael E. Smith, *DNA Identification Databases: Legality, Legitimacy, and the Case for Population-Wide Coverage*, 2003 WIS. L. REV. 413, 437–57 (2003), *with* Christine Rosen, *Liberty, Privacy, and DNA Databases*, THE NEW ATLANTIS, Spring 2003, at 37, 43–52. DNA technology is rapidly advancing and may soon allow a cost efficient means to create a universal DNA database. Kaye & Smith, *supra,* at 437–38. The universal database can acquire DNA samples by partnering with public health programs, which are currently extracting DNA from newborns to promptly diagnose genetic disease. *Id.* at 438. One of the advantages of a universal database is that it would allow law enforcement to easily exonerate innocent suspects. *Id.* at 450. However, a universal database has the potential to negatively affect society. Rosen, *supra,* at 52. DNA provides a plethora of personal information and change societal dynamics of equal treatment and personal liberty. *Id.*

15. Maryland v. King, 133 S. Ct. 1958 (2013).

16. *Id.* at 1980; *see* MD. CODE ANN. PUB. SAFETY § 2-504(a)(3)(i) (LexisNexis 2013)

majority's ruling might be too expansive.[17] The logic used by the Supreme Court may allow states to collect the DNA of all arrestees, regardless of the seriousness of the charge.[18]

This comment will examine the effects of a criminal justice system where DNA is collected from everyone who is arrested, regardless of the seriousness of the charge.[19] Part I.A will begin with an analysis of *King* to provide an understanding of how the Supreme Court decision may permit states to collect DNA from all arrestees.[20] DNA is used in the criminal justice system because of its ability to effectively identify people.[21] Part I.B discusses DNA science and provides a cursory understanding of how information is gathered from an individual's genetic code.[22] Part I.C displays how law enforcement uses DNA for criminal investigation.[23] Part I.D proves the current use of DNA database searches gives law enforcement pervasive power.[24]

If DNA is collected from every arrestee, knowledge of its use, certainty, and effectiveness would become widely recognized.[25] If crime is

(allowing the collection of DNA from arrestees when charged with burglary or a crime of violence); MD. CODE ANN. CRIM. LAW § 14-101(a) (LexisNexis 2013) (listing crimes of violence which include murder, rape, and carjacking); *see also infra* Part I.A. The Supreme Court stated that the collection of DNA from arrestees is constitutional under the following circumstances:

> When officers make an arrest supported by probable cause to hold for a serious offense and they bring the suspect to the station to be detained in custody, taking and analyzing a cheek swab of the arrestee's DNA is, like fingerprinting and photographing, a legitimate police booking procedure that is reasonable under the Fourth Amendment.

17. *King*, 133 S. Ct. at 1989 (Scalia, J., dissenting) ("Make no mistake about it: As an entirely predictable consequence of today's decision, your DNA can be taken and entered into a national DNA database if you are ever arrested, rightly or wrongly, and for whatever reason.").

18. *Id.*

19. *See id.*

20. *See infra* Part I.A.

21. *See* DAVID L. FAIGMAN ET AL., SCIENCE IN THE LAW 697–98 (2d ed. 2002) (stating every person except for twins carries around a different genetic code).

22. *See infra* Part I.B.

23. *See infra* Part I.C.

24. *See infra* Part I.D.

25. *See* Simon A. Cole, *Fingerprint Identification and the Criminal Justice System: Historical Lessons for the DNA Debate*, *in* DNA AND THE CRIMINAL JUSTICE SYSTEM: THE TECHNOLOGY OF JUSTICE 63, 65 (David Lazer ed., 2004) (stating that modern society is familiar with fingerprinting). *But see* Barry Steinhardt, *Privacy and Forensic DNA Data Banks*, *in* DNA AND THE CRIMINAL JUSTICE SYSTEM: THE TECHNOLOGY OF JUSTICE 173, 173 (David Lazer ed., 2004) ("Drawing a DNA sample is simply not the same as taking a fingerprint . . . DNA itself represents far more than a fingerprint."). *See generally* Catherine W. Kimel, Note, *DNA Profiles, Computer Searches, and The Fourth Amendment*, 62 DUKE L.J. 933, 966 (2013) (stating DNA collection statutes focus on collection from felons and violent offenders which are disproportionately African American and poor). The use and effectiveness of DNA can become widely recognized if instituted as standard arrest procedure, as displayed by modern society's

a rational choice, this knowledge could potentially become a factor in the decision to commit crime.[26] Part II examines whether the certainty and effectiveness of DNA forensics could deter crime.[27] However, social forces may affect an individual's capacity to weigh the positive and negative consequences of committing a crime.[28] Like Maverick, potential criminals may engage in behavior despite the monumental risks of suffering negative consequences.[29] Unlike Maverick, criminals are far more likely to suffer these negative consequences because DNA forensics is a very effective tool.[30] Part III analyzes how the collection of DNA from all arrestees may not deter crime and may thus provide only a small benefit when compared to the substantial costs that will be incurred by expansive collection.[31]

In *Top Gun*, Maverick was told to consider the effect his behavior would have on taxpayers.[32] This unlikely source of wisdom prompts Part IV which advises states not to adopt legislation that would allow DNA collection from all arrestees.[33] Additionally, the Federal Government should use the power within its means to entice states to regulate DNA

familiarity with fingerprinting. Cole, *supra*. In the context of criminal justice, DNA is often compared to fingerprints because both are used as biometric systems for criminal identification. *Id.* at 63. The history of fingerprints may foreshadow some potential impacts of DNA forensics. *Id.* Before fingerprinting was common, prisons used anthropomorphic identification, which involves measurement of the human body as a means to identify convicted criminals. *Id.* at 65. Eventually, fingerprinting replaced anthropomorphic identification and shifted the time of identification from conviction to arrest. *Id.* at 81. Criminal identification databases grew substantially as a result of the shift because the number of arrests was higher than the number of convictions. *Id.* Discriminatory arrest practices allow fingerprint databases to overwhelmingly consist of minorities. Cole, *supra,* at 81–82. Some critics argue the same can happen with DNA databases. Kimel, *supra.* A solution to discriminatory DNA inclusion would be a universal database, which would ensure equability. Cole, *supra,* at 83.

26. J. ROBERT LILLY ET AL., CRIMINOLOGICAL THEORY: CONTEXT AND CONSEQUENCES 341 (Jerry Westby et al. eds., 5th ed. 2011) (outlining the premise of rational choice theory which supposes that offenders weigh the positive and negative consequences of a crime before embarking on illegal behavior).

27. *See infra* Part II.

28. JOEL SAMAHA, CRIMINAL JUSTICE 90–91 (Carolyn Henderson Meier et al. eds., 7th ed. 2006). Sociological theories attempt to explain the commission of crime by examining how social groups can affect an individual's propensity to commit crime. *Id.* These theories suppose that humans are born as blank slates and learn morals and values from their surroundings. *Id.* Social learning theorists believe that criminal behavior is learned from the groups that people associate with. *Id.* Social labeling theory proposes that offenders begin to identify themselves as criminals once society has attached such label. *Id.* at 90–92. Social theories do not dispel rational choice theory but provides a slew of factors that can affect the ability to balance the positive and negative consequences of a crime. *Id.* at 90–91.

29. *See id.*

30. Etzioni, *supra* note 9.

31. *See infra* Part III.

32. TOP GUN, *supra* note 1.

33. *See infra* Part IV.

collection only to serious offenders.[34] This regulation is a compromise because it allows law enforcement to use their powerful resources while tailoring its use to ensure resources are spent wisely.[35] The regulation of DNA databases is important because, unlike heroic characters from action movies, law enforcement will cost the taxpayer substantial money in the imprudent pursuit of their benevolent actions.[36]

I. BACKGROUND

A. THE SUPREME COURT ON THE CONSTITUTIONALITY OF DNA FORENSICS

In *Maryland v. King*,[37] the Supreme Court held that law enforcement's use of inner mouth swabs to collect DNA upon arrest is within the confines of the Fourth Amendment.[38] Alonzo King was arrested in 2009 on assault charges "for menacing a group of people with a shotgun."[39] In accordance with Maryland statutory law,[40] which allows the collection of an arrestee's DNA if the arrestee is charged with a violent crime, an inner mouth swab was used during the arrest to collect King's DNA.[41] The DNA was stored in a state database and forwarded to the Federal Bureau of Investigation's ("FBI") DNA database, Combined DNA Index System ("CODIS").[42] The FBI compared King's DNA to the other profiles found in CODIS.[43] A genetic match was found with the profile of the suspected perpetrator of an unsolved rape case that occurred in 2003.[44] King was charged with rape and the DNA match was the sole evidence

34. *See infra* Part IV.

35. *See* Etzioni, *supra* note 9.

36. *See* TOP GUN, *supra* note 1.

37. Maryland v. King, 133 S. Ct. 1958 (2013).

38. *Id.* at 1980; *see also* U.S. CONST. amend. IV ("The right of the people to be secure in their persons . . . against unreasonable searches and seizures, shall not be violated . . . .").

39. *King*, 133 S. Ct. at 1965.

40. MD. CODE ANN. PUB. SAFETY § 2-504(a)(3)(i) (LexisNexis 2013) ("[A] DNA sample shall be collected from an individual who is charged with: 1. a crime of violence or an attempt to commit a crime of violence or; 2. burglary or an attempt to commit burglary.").

41. *King*, 133 S. Ct. at 1965.

42. *King*, 133 S. Ct. at 1984 (Scalia, J., dissenting) (stating that the defendant's DNA was sent to CODIS, the national DNA database). *See generally CODIS–NDIS Statistics,* FED. BUREAU OF INVESTIGATION, http://www.fbi.gov/about-us/lab/biometric-analysis/codis/ndis-statistics (last visited Feb. 13, 2014); *FAQs on CODIS*, *supra* note 10. The term CODIS refers to the national criminal justice DNA databases as well as the software, which navigates through the databases. *FAQs on CODIS*, *supra.* The National DNA Index is part of CODIS and houses over 13 million DNA profiles. *CODIS–NDIS Statistics.*

43. *King*, 133 S. Ct. at 1984. *See generally FAQs on CODIS*, *supra* note 10.

44. *King*, 133 S. Ct. at 1966 (majority opinion).

used to support the indictment.[45] The defense moved to suppress the DNA match by arguing that the Maryland statute[46] violated the Fourth Amendment.[47]

In determining whether the Maryland statute comports with the Fourth Amendment, the Supreme Court balanced the governmental interest in using DNA collection against the individual privacy intrusion posed by the collection.[48] The Court found that governmental interest in using DNA during the arrest procedure is significant because the technology allows accurate identification, which promotes safety when determining the pretrial release of arrestees charged with serious crimes.[49] In contrast, the Court found that the individual privacy intrusion posed by the DNA swab is minimal because of the following: arrestees have a diminished expectation of privacy; the inner mouth swab presents only a minimal physical intrusion into the body; and the DNA collected does not divulge personal genetic information.[50] The Supreme Court upheld the Maryland Statute and ruled "that DNA identification of arrestees is a reasonable search that can be considered part of a routine booking procedure."[51] Although the decision only specifically pertains to DNA collection of arrestees that are charged with serious offenses, the dissenters argued that the logic used in the decision may result in allowing states to collect DNA from non-serious arrestees as well.[52]

Justice Scalia wrote the dissenting opinion in *King* where he strongly disagreed with the majority, and was joined by three other justices.[53] The dissent argued that DNA collection upon arrest is not a significant governmental interest because it is not an efficient means for the identification of arrestees.[54] Fingerprints already give reliable identification results that can be rendered in a fraction of the time required by DNA analysis.[55] Additionally, the Maryland statute does not even allow

45. King v. State, 42 A.3d 549, 555 (Md. 2012).

46. MD. CODE ANN. PUB. SAFETY § 2-504 (LexisNexis 2013).

47. *King*, 133 S. Ct. at 1966. *See generally* U.S. CONST. amend. IV.

48. *King*, 133 S. Ct. at 1970–80.

49. *Id.* at 1970–77; *see also* Scott Boylan, *The Legal Rights to Identity and the Unique Identifiers of Individuals*, AM. BAR ASS'N, http://www.americanbar.org/content/dam/aba/events/administrative_law/2013/06/8th_annual_homelandsecuritylawinstitute/fabricofidentity_combined.authcheckdam.pdf (last visited Feb. 13, 2014) (giving a succinct overview of the balancing test used by the Court in *Maryland v. King*).

50. *King*, 133 S. Ct. at 1977–80.

51. *Id.* at 1980.

52. *Id.* at 1989 (Scalia, J., dissenting).

53. *See id.* at 1980–90.

54. *Id.*

55. *See id.* at 1987 (displaying a chart where the effectiveness of fingerprints as means for

DNA to be processed until after arraignment and thus cannot be used for pretrial release purposes.[56]

Furthermore, the logic where DNA is considered an efficient means of identification is problematic because it can apply equally to serious and non-serious offenses.[57] "If one believes that DNA will 'identify' someone arrested for assault, he must believe that it will 'identify' someone arrested for a traffic offense."[58] Thus, the decision sets a precedent where future state legislation may allow DNA collection of non-serious arrestees.[59] Justice Scalia stated that the majority's logic will support an over-inclusive DNA database and thus impinge on the liberties granted by the Constitution because the real function of the DNA tests is to run suspicionless searches on arrestees, which are unjustified absent any special need or probable cause.[60]

Maryland is not the only state whose legislature allows law enforcement to collect DNA upon arrest.[61] Before *King*, the constitutionality of the use of DNA in the arrest procedure was debated,[62]

identification is compared to DNA). Fingerprint analysis can yield results in twenty-seven minutes. *Id.* DNA analysis requires months before results can be generated. *Id.* In *King*, the defendant's DNA took four months to be processed. *Id.* at 1984.

56. *King*, 133 S. Ct. at 1983; *see also* MD. CODE ANN. PUB. SAFETY § 2-504(d)(1) (LexisNexis 2013) ("A DNA sample collected from an individual charged with a crime . . . may not be tested or placed in the statewide DNA data base system prior to the first scheduled arraignment date . . . .").

57. *King*, 133 S. Ct. at 1989.

58. *Id.*

59. *See id.*

60. *See id.* Justice Scalia stated that the real objective of DNA arrestee collection is to solve unsolved crimes and that fact should not be disguised. *Id.* Although solving crimes is a noble objective, the protection from suspicionless searches is more significant. *Id.*

61. *See DNA Collection Upon Arrest*, NCSTL.ORG (May 2011), http://www.ncstl.org/resources/DNACollectionUponArrest (listing states that adopted legislation which allows DNA collection upon arrest); *see, e.g.*, ALA. CODE § 36-18-24 (2013) (allowing DNA collection from any person arrested for a felony or sexual offense); ARIZ. REV. STAT. ANN. § 13-610 (2011) (allowing DNA collection from any person arrested for a felony, indecent exposure, or sexual abuse); CAL. PENAL CODE § 296.1 (West 2012) (allowing DNA collection from adults arrested and charged with a felony or juveniles that are placed in certain correctional institutions); FLA. STAT. § 943.325 (2013) (allowing DNA collection from an adult or a juvenile that is arrested for a felony).

62. Kimel, *supra* note 25, at 972–73 (drawing parallels between the information found in DNA and computers, and arguing that the act of comparing DNA for investigative reasons is an unreasonable search because it is substantially similar to the prohibited general-warrant computer search); *see also* Tracey Maclin, Symposium, *Is Obtaining an Arrestee's DNA a Valid Special Needs Search Under the Fourth Amendment? What Should (and Will) the Supreme Court Do?*, 34 J.L. MED. & ETHICS 165, 178−81 (2006) (arguing that Louisiana and Virginia state laws, which allow DNA collection from arrestees, are unconstitutional).

causing uncertainty among courts.[63] Police departments established an infrastructure that facilitated the collection of DNA despite the constitutional ambiguity.[64] *King* affirmed police efforts and explicitly approved DNA collection as a part of the arrest process.[65] DNA databases will continue to expand as a result of the *King* decision.[66] Furthermore, *King* may potentially allow states to collect DNA from all arrestee's, regardless of the severity of the charged crime.[67]

B. THE SCIENCE OF DNA

Deoxyribonucleic acid, or DNA, is a molecule that houses unique information about an organism.[68] This molecule is made up of chemicals

63. *Compare* United States v. Mitchell, 652 F.3d 387, 415–16 (3d Cir. 2011) (holding that a federal statute allowing DNA collection from arrestees comports with the Fourth Amendment), *and* State v. Emerson, 981 N.E.2d 787, 794 (Ohio 2012) (holding that the warrantless use of DNA to investigate unrelated or uncharged crime does not violate the Fourth Amendment), *with* Guilmette v. State, 986 N.E.2d 335, 341 (Ind. Ct. App. 2013) (holding that using DNA taken from an arrestee to investigate an unrelated or uncharged crime requires a warrant), *and In re* Welfare of C.T.L., 722 N.W.2d 484, 492 (Minn. Ct. App. 2006) (holding that the DNA collection of a juvenile arrestee was not constitutional because privacy interests outweigh governmental interest).

64. *Databank Statistics*, VIRGINIA DEP'T OF FORENSIC SCIENCE, http://www.dfs.virginia.gov/about-dfs/dna-databank-statistics/ (last visited Feb. 16, 2014) (displaying a graph of statistics from Virginia where the number of profiles in the DNA database has consistently increased every year from 1993); Bill Berger et al., *LODIS, a New Investigative Tool: DNA Is Not Just Court Evidence Anymore*, THE POLICE CHIEF (April 2008), http://www.policechiefmagazine.org/magazine/index.cfm?fuseaction=display_arch&article_id=1465&issue_id=42008 (describing a Florida police department's cooperation with DNA Security Inc., a DNA processing facility, to formulate a project which aims to have DNA forensics help solve local crime); *see* David Lazer, *Introduction: DNA and the Criminal Justice System*, *in* DNA AND THE CRIMINAL JUSTICE SYSTEM: THE TECHNOLOGY OF JUSTICE (David Lazer ed., 2004). DNA databases have developed nationally and locally. Lazer, *supra*, at 7. All fifty states have enacted laws authorizing DNA databases on a local level. *Id.* However, states vary in the actual use of DNA databases due to resources, criteria for inclusion, and regulation pertaining to privacy issues. *Id.* Virginia, Florida, Illinois, and New York are among the states that most utilize DNA databases in connection with criminal investigations. *Id.* at 7–8.

65. *King*, 133 S. Ct. at 1980 (majority opinion).

66. *See* Brief of Amici Curiae Electronic Privacy Information Center and Twenty-six Technical Experts and Legal Scholars in Support of Respondent at 6, Maryland v. King, 133 S. Ct. 1958 (2013) (No. 12-207), *available at* http://epic.org/amicus/dna-act/maryland/EPIC-Amicus-Brief.pdf (stating that DNA collection for criminal justice purposes is expanding).

67. *King*, 133 S. Ct. at 1989 (Scalia, J., dissenting).

68. FAIGMAN ET AL., *supra* note 21. *See generally An Overview of the Human Genome Project*, NAT'L HUM. GENOME RES. INST., http://www.genome.gov/12011238 (last updated Nov. 8, 2012) (describing the Human Genome Project, an international research program which in 2003 published the first complete map of human DNA and greatly furthered the understanding of how DNA can effect biology); *Human Genome Project*, U.S. DEP'T OF HEALTH AND HUM. SERVICES, http://report.nih.gov/nihfactsheets/ViewFactSheet.aspx?csid=45 (last visited Feb. 16, 2014); Gina Kolata, *Human Genome, Then and Now*, N.Y. TIMES (Apr. 15, 2013), http://www.ny

called nucleotides.[69] Each nucleotide contains a sugar, phosphate, and a base.[70] The sugar and phosphate creates a backbone, which forms a long line.[71] Nucleotide bases are attached to this long line at a perpendicular angle.[72] Human DNA is double stranded.[73] This means that human DNA consists of two parallel sugar-phosphate lines, each with their own respective bases attached, that twist.[74] As the parallel lines twist, the bases line up in pairs.[75]

The appearance of the twisting DNA double helix structure can be easily imagined if compared to a ladder.[76] Imagine twisting a ladder from one end to the other.[77] The twisted rails of this ladder are the long lines of sugar-phosphate.[78] Imagine cutting out the center of each rung on every level of the ladder.[79] This leaves the ladder with a space at the center of each rung.[80] On our imaginary ladder, the remains of the severed rungs line up and face each other at every level.[81] These severed rungs symbolize the

times.com/2013/04/16/science/the-human-genome-project-then-and-now.html?_r=0; *What is a genome?*, GENETICS HOME REFERENCE, http://ghr.nlm.nih.gov/handbook/hgp/genome (last visited Feb. 16, 2014). "A genome is an organism's complete set of DNA . . . ." *What is a genome?*, *supra*. The map of DNA published by the Human Genome Project is used as a reference whereby researchers can study the particular functions of different section of DNA. Kolata, *supra*. The usefulness of DNA can be illustrated by many of the findings that have occurred subsequent to the completion of the human genome in 2003. *Human Genome Project*, *supra*. Recent research has found that there are more than 1,800 disease related genes and more than 2,000 tests which can diagnose ailments through the use of DNA. *Id.*

69. LORI B. ANDREWS ET AL., GENETICS: ETHICS, LAW AND POLICY 18 (2d ed. 2006).

70. *Id.*

71. NAT'L RESEARCH COUNCIL, THE EVALUATION OF FORENSIC DNA EVIDENCE 12 (1996) (stating that the sugar and phosphate in nucleotides come together to act as a backbone for a base).

72. *See* J.D. Watson & F. H. C. Crick, *Molecular Structure of Nucleic Acids: A Structure for Deoxyribose Nucleic Acid*, 171 NATURE 737, 737 (1953) (giving an illustration of the structure of DNA).

73. NAT'L RESEARCH COUNCIL, *supra* note 71. *See generally* Watson & Crick, *supra* note 72 (reporting the seminal study that discovered the double helix structure of DNA); Lotta Fredholm, *The Discovery of the Molecular Structure of DNA – the Double Helix*, NOBELPRIZE.ORG (Sept. 30, 2003), http://www.nobelprize.org/educational/medicine/dna_double_helix/readmore.html (describing how James Watson and Francis Crick elucidated the structure of DNA). James Watson and Francis Crick won the Nobel Prize in 1962 for their discovery of the double helix structure of DNA. Fredholm, *supra*.

74. NAT'L RESEARCH COUNCIL, *supra* note 71.

75. *Id.*

76. ANDREWS ET AL., *supra* note 69 (analogizing the double helix structure of DNA to the structure of a ladder).

77. *See id.*

78. *Id.*

79. *See id.*

80. *See id.*

81. *Id.*

bases.[82] On every level, the ladder has a base attached respectively to the left rail and the right rail.[83] Thus, every level on the ladder contains two bases that form a base pair.[84]

The arrangement of the base pairs is the important part of DNA because it creates specific codes of information that can be used for a variety of reasons.[85] There are four bases which are abbreviated to A, T, G, and C.[86] G is always paired with C.[87] T is always paired with A.[88] All of the codes formed by the base pairs are written in the chromosomes.[89] Chromosomes act like books, containing long sequences of the four base letters with about three billion base pairs in total.[90] Every person has two sets of chromosomes.[91] One set is inherited from the mother;[92] the other set is inherited from the father.[93] Each chromosome is a separate book containing long sequences of genetic information, which is stored in the nuclei of most cells.[94] The nucleus of a cell is the bookshelf where the genetic books are stored.[95] All the cells in one person house the same bookshelf which "contain[s] copies of the same set of books."[96] The genome is the library where all of the bookshelves containing an individual's genetic information are stored.[97]

82. ANDREWS ET AL., *supra* note 69.

83. *See* NAT'L RESEARCH COUNCIL, *supra* note 71.

84. *Id.*

85. FAIGMAN ET AL., *supra* note 21. *See generally* JOHN M. BUTLER, FUNDAMENTALS OF FORENSIC DNA TYPING 9 (2010); ANNE HART, INFANT GENDER SELECTION & PERSONALIZED MEDICINE: CONSUMER'S GUIDE 27 (2005); CHRIS POMERY, DNA AND FAMILY HISTORY: HOW GENETIC TESTING CAN ADVANCE YOUR GENEALOGICAL RESEARCH 1 (2004). "DNA interest ranges from forensics and anthropology to nutrition, care giving, family scrap booking and healthcare knowledge." HART, *supra*.

86. ANDREWS ET AL., *supra* note 69.

87. *Id.*

88. *Id.*

89. FAIGMAN ET AL., *supra* note 21, at 698.

90. *Id.* (analogizing chromosomes to books because chromosomes store a plethora of information).

91. *See Chromosomes*, NAT'L HUMAN GENOME RESEARCH INST., http://www.genome.gov/26524120 (last updated June 8, 2012).

92. *Id.*

93. *Id.*

94. *See* LISTER HILL NAT'L CTR. FOR BIOMEDICAL COMMC'NS, DEP'T OF HEALTH & HUMAN SERVS., GENETICS HOME REFERENCE: YOUR GUIDE TO UNDERSTANDING GENETIC CONDITIONS 13 (2014) [hereinafter GENETICS HOME REFERENCE], http://ghr.nlm.nih.gov/handbook.pdf.

95. FAIGMAN ET AL., *supra* note 21, 698–99 (analogizing the nucleus of a cell to a library).

96. *Id.* at 698; *see Deoxyribonucleic Acid (DNA)*, NAT'L HUMAN GENOME RESEARCH INST., http://www.genome.gov/25520880 (last updated June 13, 2012) (showing an illustration of the relationship between DNA, chromosomes, and cell nuclei).

97. FAIGMAN ET AL., *supra* note 21, at 698; *see* Joylette Portlock, *DNA Basics*, THE TECH

The different regions of a DNA molecule each serve their respective purposes.[98] Some regions of DNA give instructions for making proteins.[99] These sections are called genes and consist of anywhere from 1,000 to 10,000 base pairs.[100] Genes are responsible for the structural components of the body as well as the biochemical reactions within the body.[101] Forensic DNA analysis does not involve genes.[102] Rather, forensic analysis concerns sequences of base pairs that do not code for specific proteins.[103] These non-coding regions of DNA are usually referred to as "junk DNA,"[104] because their functions were historically seen as unimportant when compared to genes.[105]

MUSEUM OF INNOVATION (May 28, 2004), http://genetics.thetech.org/ask/ask18 (providing a simple and concise overview of how the human genome works). The human genome and all the DNA therein is responsible for making proteins. Portlock, *supra.* Proteins are responsible for a vast amount of functions in the human body, some of which include giving energy and digesting food. *Id.* DNA creates or cooks proteins by using the information found in chromosomes as cookbooks. *Id.* Each cookbook houses sequences of base pairs which act like recipes. *Id.* The recipes are delivered from the nucleus of the cell to the cytoplasm, which acts like the kitchen where the recipe can be converted into food. *Id.*

98. FAIGMAN ET AL., *supra* note 21, 698–99 (making a distinction between genes which code for proteins and other regions of the DNA molecule that do not code for proteins).

99. *See What Do Your Genes Do?*, SCIENCEMUSEUM.ORG, http://www.sciencemuseum.org.uk/whoami/findoutmore/yourbody/howdoyoubecomeyou/whatdoyourgenesdo.aspx (last visited Feb. 17, 2014). *See generally* GENETICS HOME REFERENCE, *supra* note 94, at 17 (stating that proteins are complex molecules that are responsible for most of the work performed by cells and they form the structure, function, and regulation of the tissues and organs in the human body).

100. FAIGMAN ET AL., *supra* note 21, at 698.

101. *See Genetics 101 Part 1: What Are Genes?*, KHAN ACADEMY, https://www.khanacademy.org/science/biology/heredity-and-genetics/v/genetics-101-part-1--what-are-genes (last visited Feb. 17, 2014).

102. FAIGMAN ET AL., *supra* note 21, at 699. *See generally* BUTLER, *supra* note 85, at 4. Alec Jeffreys, an English geneticist, created DNA forensics as a means of criminal identification. BUTLER, *supra* note 85, at 4.

103. *See* Cold Spring Harbor Laboratory, *The Human Genome: Genes and Non-Coding DNA, 3D Animation with Basic Narration*, THE DNA LEARNING CENTER, http://www.dnalc.org/view/15486-The-human-genome-genes-and-non-coding-DNA-3D-animation-with-basic-narration.html (last visited Feb. 17, 2014) (giving an animated representation of the difference between coding DNA and non-coding DNA).

104. *See* Maryland v. King, 133 S. Ct. 1958, 1967 (2013) ("The term [junk DNA] apparently is intended to indicate that this particular noncoding region, while useful and even dispositive for purposes like identity does not show more far-reaching and complex characteristics like genetic traits."). *But see, e.g.*, Steinhardt, *supra* note 25. Unlike coding DNA, non-coding DNA is thought to be devoid of any private data. *King*, 133 S. Ct. at 1967. However, some believe that future research will show that useful genetic information is contained within non-coding DNA. Steinhardt, *supra* note 25.

105. *See King*, 133 S. Ct. at 1967. *But see* The ENCODE Project Consortium, *Identification and Analysis of Functional Elements in 1% of the Human Genome by the ENCODE Pilot Project*, 447 NATURE 799, 799 (2007); Jenny Marder, *Mysterious Noncoding DNA: 'Junk' or Genetic Power Player?*, PBS (Nov. 7, 2011, 4:03 PM), http://www.pbs.org/newshour/rundown/2011/11/junk-dna.html (stating that although non-coding DNA was believed to be nonfunctional, some

The non-coding regions of DNA contain considerable sequence variation, which allows for effective identification between individuals because most of the DNA between any two individuals is identical.[106] Forensic analysis confines its examination to a limited and particular position within the vast DNA molecule.[107] A locus is a particular position within a particular chromosome that can be universally referred to and found on any two individuals.[108] Like a page in the chromosome book, a locus allows a forensic analyst to have a uniform point of reference on the vast DNA molecule.[109] When examining a particular locus, an analyst looks for alleles, differences in the lettering between both copies of chromosomes.[110] Looking for alleles is akin to opening two of the same chromosome books and looking for misspellings between the copies.[111]

modern researchers are finding that these unexplored regions of DNA may play important roles); *New Findings Challenge Established Views on Human Genome*, NAT'L HUMAN GENOME RESEARCH INST., http://www.genome.gov/25521554 (last updated July 7, 2011). Recent findings show that non-coding DNA interacts with genes in overlapping ways that are not yet fully understood by scientists. The ENCODE Project Consortium, *supra; New Findings Challenge Established Views On Human Genome*, *supra*. Scientists claim the following:

> [R]esearch has shown that diseases like bipolar syndrome and clinical depression may be associated with noncoding mutations that determine whether the brain is producing too much or not enough of a particular neurotransmitter. One noncoding mutation gives a person almost complete protection against the nasty malaria parasite, plasmodium vivax. Another piece of noncoding DNA regulates the enzyme responsible for lactose tolerance, the ability to digest milk.

Marder, *supra*.

106. Frederick Bieber, *Science and Technology of Forensic DNA Profiling: Current Use and Future Directions*, *in* DNA AND THE CRIMINAL JUSTICE SYSTEM: THE TECHNOLOGY OF JUSTICE 23, 26 (David Lazer ed., 2004). Ninety-eight percent of human DNA shows almost no variation within the population. *Id.* Thus, only about two percent of human DNA carries sufficient variation to allow forensic analysis. *Id.*

107. KEITH INMAN & NORAH RUDIN, AN INTRODUCTION TO FORENSIC DNA ANALYSIS 34 (1997).

108. *See* FAIGMAN ET AL., *supra* note 21, at 698.

109. *See DNA Evidence: Basics of Analyzing*, NAT'L INST. OF JUSTICE (Aug. 9, 2012), http://www.nij.gov/topics/forensics/evidence/dna/basics/analyzing.htm (describing the process of forensic DNA analysis).

110. *See id.*

111. *See* John M. Butler, *Genetics and Genomics of Core Short Tandem Repeat Loci Used in Human Identity Testing,* 51 J. FORENSIC SCI. 253, 257, 258, 262 (2006) (replicating the process used by the FBI to yield extra copies of a limited DNA sample and concluding that allelic variation is a reliable way to determine an individual's identity); FAIGMAN ET AL., *supra* note 21, at 699.

C. LAW ENFORCEMENT USE OF DNA

The FBI currently examines thirteen different loci to identify individual DNA samples in the CODIS database.[112] Referring to thirteen different sections on a chromosome increases the effectiveness of the identification process.[113] Finding two samples of DNA that have the same alleles in all thirteen loci would recover a direct match.[114] However, DNA samples must be readable before law enforcement can find a direct match.[115]

When a DNA sample is taken with a buccal swab during the arrest procedure, as was the case in *King*, the integrity of that sample may be easily preserved because of the controlled conditions of the extraction.[116] Thus, the integrity of the offender index profiles in CODIS are well preserved and all thirteen loci can be discriminately examined.[117] However, the DNA samples that comprise the offender index are compared to samples from the forensic index, which are samples collected from crime scenes.[118] The integrity of the samples found at crime scenes are more often compromised because controlled conditions are not present during the

112. *FAQs on CODIS*, *supra* note 10.

113. *See* NATHAN JAMES, CONG. RESEARCH SERV., R41800, DNA TESTING IN CRIMINAL JUSTICE: BACKGROUND, CURRENT LAW, GRANTS, AND ISSUES 4 (2012) ("The 13 core loci chosen by the FBI provide a high level of discriminatory power."); *see also Planned Process and Timeline for Implementation of Additional CODIS Core Loci*, FED. BUREAU OF INVESTIGATION, http://www.fbi.gov/about-us/lab/biometric-analysis/codis/planned-process-and-timeline-for-implementation-of-additional-codis-core-loci (last visited Feb. 17, 2014) (describing the plan to increase the accuracy and effectiveness of DNA analysis by increasing the required number of loci in the national database).

114. Henry T. Greely et al., *Family Ties: The Use of DNA Offender Databases to Catch Offender's Kin*, 34 J.L. MED. & ETHICS 248, 250–51 (2006). "The odds that an unrelated person shares the same set of thirteen pairs are normally infinitesimal – at most one in several hundred billion, compared with a total of 6.3 billion living humans. Two random Americans will share, on average, about two or three alleles." *Id.* at 250.

115. *See* FAIGMAN ET AL., *supra* note 21, at 708 (stating that a DNA sample needs to be of a particular quantity and quality to be useful for testing purposes).

116. *See* Maryland v. King, 133 S. Ct. 1958, 1965 (2013).

117. *See FAQs on CODIS*, *supra* note 10. The profiles contained in the offender index consist of DNA samples of individuals who have been charged or convicted of crimes. *Id.*

118. *Id.*

commission of a crime.[119] Thus, DNA samples from the forensic index may not render reliable results for a variety of reasons.[120]

A sample may be deemed unreadable if it is of insufficient quantity.[121] The types of samples that are found at crime scenes may vary in DNA content.[122] A reliable sample must have anywhere from fifty to one hundred billionths of a gram of DNA.[123] That means that receiving a successful DNA match from a crime scene may depend on the sample that is left at the scene.[124] For instance, a one centimeter stain of blood has a success rate of over ninety-five percent.[125] However, blood and semen have a higher DNA content than hair or skin cells.[126] Accordingly, a root

119. *See generally Talk of the Nation: Analysing the Evidence on DNA* (NPR radio broadcast Sept. 28, 2012), *available at* http://www.npr.org/2012/09/28/161955789/analysing-the-evidence-on-dna (discussing the intricacies of finding criminal related DNA at crime scenes). The computer resolution used to analyze DNA is so high that much of the DNA found at crime scenes can be analyzed. *Id.* This presents a problem for analysts because much of the DNA found at crime scenes does not pertain to the crime. *Id.* Analysts must narrow the focus of their search so that the DNA examined pertains to the crime. *Id.*

120. *See* FAIGMAN ET AL., *supra* note 21, at 708.

121. *Id.* (determining whether a particular sample can undergo DNA typing depends on the quantity of DNA present in that particular sample and the extent of degradation).

122. *See id.* at 708–09 (discussing that while every human cell contains the same amount of DNA the amount of cells available to sample can vary greatly).

123. *Id.* at 709 (stating samples usually must contain at least fifty to one hundred billionths of a gram of DNA); *see* MAX M. HOUCK & JAY A. SIEGEL, FUNDAMENTALS OF FORENSIC SCIENCE 272 (2d ed. 2010); INMAN & RUDIN, *supra* note 107, at 33; NAT'L RESEARCH COUNCIL, *supra* note 71, at 69; *see also FAQs on CODIS*, *supra* note 10. The amount of DNA needed to render a reliable sample depends on the test that is being used to analyze or "type" the DNA. FAIGMAN ET AL., *supra* note 21, at 709. PCR-based typing is a laboratory procedure whereby short segments of base pairs, no more than 1,000, are copied millions of times. NAT'L RESEARCH COUNCIL, *supra* note 72, at 69–70. This is a useful form of DNA amplification because it allows for reliable analysis from a small sample of DNA. INMAN & RUDIN, *supra* note 107, at 42. Mitochondrial DNA analysis allows for a reliable test with DNA from even fewer cells than that needed for PCR-based typing. FAIGMAN ET AL., *supra* note 21, at 709. Mitochondrial DNA is different from the genomic DNA analyzed by PCR-based testing. *Id.* Genomic DNA is housed in the nucleus of a cell, of which there is only one. *Id.* By comparison, every cell in the human body houses hundreds or thousands of mitochondrial DNA. HOUCK & SIEGEL, *supra*. Mitochondrial DNA can be more useful than genomic DNA for forensics because it is more pervasive in cells which allows for the testing of samples that have low quantities of cellular DNA, are degraded, or are old. *Id.* However, the FBI currently uses PCR-based testing to generate DNA data. *FAQs on CODIS*, *supra* note 10.

124. *See* FAIGMAN ET AL., *supra* note 21, at 750–51 (providing a table of different biological samples and their respective success rates in identifying individuals).

125. *Id.* at 751.

126. *Id.* at 750–51. DNA content is measured in nanograms, which is one billionth of a gram. *Id.* A post-coital vaginal swab may contain anywhere from zero to three thousand nanograms of DNA. *Id.* A centimeter stain of blood may contain two hundred nanograms worth of DNA. *Id.*

end of shed hair has less than a twenty percent chance of success for a reliable reading.[127]

The quality of a DNA sample may also render the sample unreliable.[128] Samples found at crime scenes may be exposed to extreme temperatures, oxygen, and water, which can degrade DNA.[129] Contamination poses the biggest threat of degradation to DNA.[130] Contamination may result in the recognition of a microbial DNA sequence.[131] This presents a second DNA sequence within one sample and may interfere with the analysis of the initial and intended sample.[132] However, testing procedures instituted by a lab can eliminate the problems posed by contamination.[133]

Despite issues posed by samples of insufficient quantity and quality, police efforts to use DNA are not substantially stymied.[134] Degradation to the point of complete unreliability does not easily occur because under most circumstances DNA analysis only requires the examination of one hundred base pairs.[135] Even a small sample can yield enough DNA to read the hundred base pairs.[136] Thus, even if the bulk of the DNA is degraded, a reliable reading may still be performed.[137] Although the application of DNA forensics is often criticized,[138] using the thirteen alleles as a means to

127. *Id.* at 751. A root end of shed hair may contain anywhere from zero to twelve nanograms of DNA. *Id.*

128. *Id.* at 710.

129. *Id. But see* Peter Gill et al., *Identification of the Remains of the Romanov Family by DNA Analysis*, 6 NATURE GENETICS 130, 130 (1994) (recounting the DNA identification process of the hundred year old Tsar Nicholas family); Oliva Handt et al., *Molecular Genetic Analyses of the Tyrolean Ice Man*, 264 SCIENCE 1775, 1775 (1994) (giving an overview of the process used to analyze the DNA of a man who had been frozen for five thousand years). Studies have shown that although DNA can be susceptible to degradation, PCR-based testing can be an effective means to identify DNA that has been exposed to the agents of degradation. Gill et al., *supra*; Handt et al., *supra*.

130. FAIGMAN ET AL., *supra* note 21, at 71011. Contamination occurs from exposure to natural elements such as air. *Id.* DNA samples that are shielded from air and other natural elements degrade at a much slower rate. *Id.*

131. *Id.* at 711.

132. *Id.*

133. *See id.*

134. *See id.* at 708–11 (explaining that procedures can help forensic analysts overcome the problems posed by contamination and degradation).

135. *Id.* at 710.

136. FAIGMAN ET AL., *supra* note 21, at 710.

137. *Id.* at 711 ("DNA can be exposed to a great variety of environmental insults without any effect on its capacity to be typed correctly.").

138. *E.g.*, Osagie K. Obasogie, *High-Tech, High-Risk Forensics*, N.Y. TIMES (July 24, 2013), http://www.nytimes.com/2013/07/25/opinion/high-tech-high-risk-forensics.html?_r=0 (telling the story of a man whose DNA was inadvertently transported to a crime scene and who spent more

accurately identify criminals is widely deemed reliable.[139] The effectiveness and reliability of DNA forensics allows law enforcement an incredible amount of power to investigate crimes.[140]

D. FAMILIAL SEARCHING: THE FULL EXTENT OF POWER GRANTED BY DNA FORENSICS

In 1974 Dennis Rader began a killing spree that lasted nearly thirty years and claimed the lives of ten innocent victims.[141] Rader would surprise victims, tie them up, and torture them to death.[142] He named himself the BTK (bind, torture, kill) killer after his gruesome murdering style.[143] The BTK killer hid from police for years, murdering sporadically.[144] Although the DNA of the BTK killer was found at crime scenes, the police could not find an adequate genetic match for the samples retained.[145] Law enforcement eventually learned the BTK killer's identity after he sent a letter to the media, leading officers to reopen their investigation.[146]

Instead of alerting Rader of the suspicion, the police obtained a subpoena for his daughter's medical records.[147] That subpoena allowed the

than five months in jail as a result of the mistake). Lukis Anderson was charged with the murder of millionaire Raveesh Kumra after a forensics team found his DNA at the scene of the crime. *Id.* However, medical records corroborated that Anderson was hospitalized during the time of the robbery. *Id.* Prosecutors realized that Anderson's DNA must have been inadvertently transported by the paramedics to the crime scene. *Id.*

139. *See generally* Butler, *supra* note 111 (giving an overview of the science involved with using the set of core STR loci for DNA typing). The set of core STR loci, which are used by the FBI, are useful because the high degree of variability between them allows an analyst to differentiate between individuals. *Id.* at 253, 262.

140. *See* Bieber, *supra* note 106, at 23 (stating "[c]rime scene DNA evidence compared to known samples from victims or suspects has proven fundamental in the resolution of felony crimes . . . .").

141. Norman D. Williams & Kenneth Landwehr, *Bind, Torture, Kill: The BTK Investigation*, THE POLICE CHIEF (2006), http://www.policechiefmagazine.org/magazine/index.cfm?fuseaction=display_arch&article_id=1065&issue_id=122006 (last visited Feb. 17, 2014).

142. *Id.* (stating that Rader named himself BTK to stand for bind, torture, kill, which were the methods he used to kill his victims).

143. *Id.*

144. *See id.*

145. *See id.*

146. *Id.* Rader would send taunting messages to the police through news reporters. *Id.* Eventually Rader sent a computer disk to the police, which contained an electronic imprint. *Id.* The computer disk showed that a man named Dennis had saved information onto the disk at a local nearby church. *Id.* The police searched for members of the congregation named Dennis and found the president of the congregation was named Dennis. *Id.* Dennis Rader was on the list, giving police sufficient suspicion that Rader was the BTK killer. *Id.*

147. Williams & Landwehr, *supra* note 141.

police to obtain Rader's daughter's Pap smear tissue without her consent.[148] The DNA from the daughter's tissue sample showed that the BTK killer was her father.[149] Rader was arrested, and he eventually confessed to committing ten homicides.[150]

The Police's use of familial searching to find the BTK killer demonstrates the outer limits of the scope of power given to law enforcement by DNA forensics.[151] Familial searching occurs when law enforcement uses the DNA of a suspect's relative to help solve a crime.[152] Law enforcement is given wide search capabilities by the CODIS software, which allows for three different types of searches of DNA: high stringency, moderate stringency, and low stringency.[153] The number of possible genetic matches increases as the search moves from high to low.[154] For example, a high stringency search attempts to find one genetic match between DNA samples that share all of the same alleles on all of the thirteen loci.[155] In the BTK investigation, the high stringency search did not help the investigators because there was no DNA sample that exactly matched the DNA found at the crime scenes.[156]

Relaxed stringency searches attempt to find several DNA profiles that share some alleles but not all.[157] These relaxed standards can effectively narrow the scope of an investigation because family members share much of the same DNA, due to their shared ancestry.[158] Children share half of

148. Ellen Nakashima, *From DNA of Family, a Tool to Make Arrests*, WASH. POST (April 21, 2008), http://www.washingtonpost.com/wp-dyn/content/article/2008/04/20/AR2008042002388.html.

149. Williams & Landwehr, *supra* note 141.

150. *Id.*

151. *See* Nakashima, *supra* note 148. There are many opponents of familial searching who feel that it impinges on civil liberties and should thus be regulated. *Id.* Mitch Morrissey, the Denver District Attorney and a proponent of familial searching, feels that regulating the familial searching capabilities of DNA would be a mistake because it is such a powerful tool against crime. *Id.* He explains, "It's like you build a Porsche and you drive it like a Pinto." *Id.*

152. *See* Erin Murphy, *Relative Doubt: Familial Searches of DNA Databases*, 109 MICH. L. REV. 291, 297–98 (2010).

153. Eva Steinberger & Gary Sims, *Finding Criminals Through the DNA of Their Relatives—Familial Searching of the California Offender DNA Database*, 31 PROSECUTOR'S BRIEF 28, 30 (last visited June 3, 2014).

154. *Id.* at 31. *See generally FAQs on CODIS*, *supra* note 10 (providing a chart which lists the 13 loci used by the federal government and displays the allelic differences between a high stringency search and a moderate search).

155. Steinberger & Sims, *supra* note 153.

156. *See generally* Nakashima, *supra* note 148 (addressing the difficulty of catching the BTK killer).

157. *See* Steinberger & Sims, *supra* note 153, at 31.

158. *See* Frederick R. Bieber et al., *Finding Criminals Through DNA of their Relatives*, 312 SCI. 1315, 1315 (2006).

their DNA with parents, and siblings share identical DNA profiles at an average of four loci.[159] Law enforcement used the relaxed standards when comparing Rader's DNA to his daughter's DNA.[160] Although the two DNA samples were different, there were sufficient similarities between the samples to justify a high statistical probability that the samples belonged to a parent and his or her child.[161]

The BTK killer investigation highlights the pervasive power given to law enforcement by DNA forensics.[162] This power allows law enforcement to confiscate and test the DNA of an individual who they know is innocent.[163] Rader's daughter had never been convicted of a crime, did not have her DNA in a criminal database, and was in no way connected to her father's killings.[164] Furthermore, the BTK investigation shows that law enforcement does not need consent to collect the DNA samples of an innocent party.[165] Rader's daughter's DNA was taken surreptitiously to help solve an investigation pertaining to her father's crimes.[166] The invasion of privacy posed by familial searching has prompted many critics to suggest that DNA forensics is an impingement on American civil liberties.[167] Although some states regulate the use of familial searching, other states openly embrace this power which allows law enforcement to cast an incredibly wide net when searching for criminals.[168] The

159. Bieber, *supra* note 106, at 47. *See generally* FAIGMAN ET AL., *supra* note 21, at 698 (explaining the genetic makeup children share with their parents).

160. Nakashima, *supra* note 148.

161. *Id. See generally* Alan R. Templeton, *Biodiversity at the Molecular Genetic Level: Experiences from Disparate Macroorganisms*, *in* BIODIVERSITY: MEASUREMENT AND ESTIMATION 59, 62 (D. L. Hawksworth ed., 1995); Steinberger & Sims, *supra* note 153, at 31. There are a few alleles that are common among humans and a large number of alleles that are rare. Templeton, *supra*. Rare alleles are most likely shared between the DNA profiles of close relatives. Steinberger & Sims, *supra* note 153, at 31. The CODIS software can search for DNA profiles that share alleles but cannot determine whether the shared alleles are common or rare. *Id.* Supplemental software was created to generate a group of profile candidates that have a high likelihood of being closely related. *Id.*

162. *See generally* Williams & Landwehr, *supra* note 141 (showing that between 2004 and 2005, 1,300 DNA swabs were taken by law enforcement officers in connection to the BTK killings).

163. *See generally id.* (demonstrating that investigators eliminated suspects by randomly conducting DNA swabbing).

164. *See* Colin McFerrin, *DNA, Genetic Material, And a Look at Property Rights: Why You May Be Your Brother's Keeper*, 19 TEX. WESLEYAN L. Rev. 967, 975 (2013).

165. *See* Nakashima, *supra* note 148.

166. *See id.*

167. *See id.*

168. Sonia M. Suter, *All in the Family: Privacy and DNA Familial Searching*, 23 HARV. J.L. & TECH. 309, 326–27 (2010). *See generally* Steinberger & Sims, *supra* note 153, at 28 (stating that the Department of Justice manages and administers the DNA data bank and California performs 1.1 million searches per week on that data base). Individual states are given latitude to

effectiveness of this wide net prompts proponents to suggest that familial searching is a major technological breakthrough that should be frequently employed by law enforcement.[169]

II. WHETHER DNA FORENSICS DETER CRIME

Deterrence theories[170] view the decision to commit a crime as a rational choice.[171] Accordingly, a potential offender performs a cost benefit

decide the level of regulation given to familial searches. *See* Suter, supra. States vary in level of regulation. *See id.* Maryland forbids the use of familial searching, while California openly embraces such searches. *Id.* at 326. California houses the fourth largest DNA database in the world. Steinberger & Sims, *supra*.

169. *See* Mitchell R. Morrissey, *A Tool to Protect Communities*, N.Y. TIMES (July 15, 2010, 11:28 AM), http://www.nytimes.com/roomfordebate/2010/07/14/how-far-should-the-dna-dragnet-go/familial-dna-searches-protect-communities. Mitchell Morrissey claims that familial searching can increase the number of investigative leads by forty percent. *Id.* Morrissey believes that law enforcement carries the responsibility of using familial searching because it increases public safety. *Id.*

170. *See* GENNARO F. VITO & JEFFERY R. MAAHS, CRIMINOLOGY: THEORY, RESEARCH, AND POLICY 52 (Sean Connelly ed., 3d ed. 2012); L. THOMAS WINFREE, JR. & HOWARD ABADINSKY, UNDERSTANDING CRIME: ESSENTIALS OF CRIMINOLOGICAL THEORY 41−42 (Linda Schreiber ed., 3d ed. 2010); Raymond Paternoster, *Absolute and Restrictive Deterrence in a Panel of Youth: Explaining the Onset, Persistence/Desistence, and Frequency of Delinquent Offending*, 36 SOC. PROBS. 289, 290 (1989); Kirk R. Williams & Richard Hawkins, *Perceptual Research on General Deterrence: A Critical Review*, 20 LAW & SOC'Y REV. 545, 545–46 (1986). There are many theories of deterrence. WINFREE & ABADINSKY, *supra*. General and specific deterrence are terms that illustrate the different ways that an individual can perceive the negative sanctions associated with crime. *Id.* General deterrence occurs when the general population is dissuaded from committing a crime because of the perceived threat of sanctions associated with that crime. Williams & Hawkins, *supra* at 545 n.1. A person can be generally deterred and never have personally experienced a sanction. WINFREE & ABADINSKY, *supra*, at 42. Public executions were often conducted with general deterrence as a goal. *Id.* The convicted person, who was condemned to death, was often made to recite their crime publically before execution in hopes that others would learn from the mistakes of the condemned. *Id.* Specific deterrence occurs when a particular person is deterred from crime because of a previous personal experience with a sanction. Williams & Hawkins, *supra,* at 545 n.1. Specific deterrence is thought to combat recidivism by making sure that a person is dissuaded from committing the same criminal act twice. WINFREE & ABADINSKY, *supra*. Absolute and restrictive deterrence are another set of terms that illustrates the different effects that deterrence may have on individuals. VITO & MAAHS, *supra.* Absolute deterrence occurs when an individual is deterred and ceases all criminal activity as result of the deterrence. *Id.* Restrictive deterrence occurs when an individual only lessens the extent of criminal behavior as a result of deterrence. *Id.*

171. WINFREE & ABADINSKY, *supra* note 170, at 41. *See generally* CESARE BECCARIA, AN ESSAY ON CRIMES AND PUNISHMENTS 21–2 (Mons. De Voltaire trans., 4th ed. 2006). Cesare Beccaria is credited as one of the originators of classical deterrence theory. WINFREE & ABADINSKY, *supra* note 170, at 39–41. Beccaria wrote during the age of enlightenment and thus posits much importance on human rationality. *See* WINFREE & ABADINSKY, *supra*, at 39. Beccaria felt that individual passion often leads people to seek objects of immediate gratification. *Id.* These objects are sometimes incongruent with what is good for society. *See id.* at 39–40. Punishment is a motive against these individual passions which serves to disincentivize crime and

analysis whereby the possible positive and negative effects of a crime are weighed.[172] The potential offender commits a crime only if the positive effects of the crime outweigh the risk and negative effects associated with sanctions.[173] An example of deterrence is found in the effect of police presence on average driving speed.[174] Drivers tend to lower their speed in the presence of police because the positive effect of speeding, arriving early at the destination, does not outweigh the negative effect of the violation, receiving an expensive ticket.[175] The presence of police increases the certainty of receiving a sanction by increasing the risk of paying the consequences.[176] Many theorists have studied how the certainty of receiving a sanction affects behavior.[177] These studies have found that a high degree of certainty in receiving sanctions is likely to deter illegal behavior.[178]

keeps society functioning. *Id.*

172. *See* WINFREE & ABADINSKY, *supra* note 170.

173. VITO & MAAHS, *supra* note 170, at 51. The assumption of deterrence theory, "leads to a relatively simple theory of crime: [p]eople will engage in criminal behavior when it brings them pleasure (generates rewards) and carries little risk of pain." *Id.*

174. *See* RAHIM F. BENEKOHAL, SPEED REDUCTION METHODS AND STUDIES IN WORK ZONES: A SUMMARY OF FINDINGS 22 (1992), http://ict.uiuc.edu/publications/report%20files/TES-076.pdf. In a study conducted for the Illinois Department of Transportation, the presence of a patrolling marked police car was found to reduce the vehicle speed by an average of about four miles per hour. *Id.* The number of vehicles that exceeded the speed limit was reduced by fourteen percent for cars and thirty-two percent for trucks. *Id.*

175. *See id.*; VITO & MAAHS, *supra* note 170, at 51.

176. *See* BENEKOHAL, *supra* note 174.

177. Daniel S. Nagin & Greg Pogarsky, *Integrating Celerity, Impulsivity, and Extralegal Sanction Threats Into a Model of General Deterrence: Theory and Evidence*, 39 CRIMINOLOGY 865, 865 (2001) ("Deterrence studies focusing on the certainty and severity of sanctions have been a staple of criminological research for more than 30 years."); *see, e.g.*, Julie Horney & Ineke Haen Marshall, *Risk Perceptions Among Serious Offenders: The Role of Crime and Punishment*, 30 CRIMINOLOGY 575, 587 (1992) (finding that having been previously arrested for a crime increases the perception of risk associated with that crime and thus lowers future participation in that crime). *See generally* Jerry Parker & Harold G. Gransmick, *Linking Actual and Perceived Certainty of Punishment: An Exploratory Study of an Untested Proposition in Deterrence Theory*, 17 CRIMINOLOGY 366, 377 (1979) (providing evidence that burglars become aware of arrests rates through personal and informal means). Studies show that potential offenders are aware of the certainty of sanctions associated with particular crimes. Parker & Gransmick, *supra* at 376–77. Furthermore, studies also suggest that the knowledge of the high risk of getting caught may deter a person from committing the act. Horney & Marshall, *supra* at 586–87.

178. *See* Greg Pogarsky, *Deterrence and Decision Making: Research Questions and Theoretical Refinements*, *in* HANDBOOK ON CRIME AND DEVIANCE 241, 242 (Marvin D. Krohm et al. eds., 2009) [hereinafter DETERRENCE AND DECISION MAKING]; Greg Pogarsky, *Projected Offending and Contemporaneous Rule-Violation: Implications For Heterotypic Continuity*, 42 CRIMINOLOGY 111, 117 (2004) [hereinafter *Projected Offending*]; David Weisburd et al., *The Miracle of the Cells: An Experimental Study of Interventions to Increase Payment of Court-Ordered Financial Obligations*, 7 CRIMINOLOGY & PUB. POL'Y 9, 11 (2008). A study by Pogarsky used a student sample to detect the correlation between current and projected rule

Rational choice theory only provides a partial understanding of the underpinnings of criminal behavior.[179] Crime must be understood through social means as well.[180] Social process theories, including Social learning theory, examines interactions among groups to explain criminal behavior.[181] Differential association is a form of social learning theory, which claims that crime is learned by having intimate relationships and communicating with groups of people that define criminal behavior in ways that favor violation of the law.[182] Interactions with family members

violation. *Projected Offending*, *supra*. In the study, the subjects were given a survey on drunk driving where the likelihood of their decision to drive drunk under varying hypothetical circumstances was examined. *Id.* at 119. Additionally, trivia questions were placed in the back of the survey. *Id.* Students were given a cash prize if the answers to the trivia questions were correct. *Id.* at 117. The correct answers to the trivia questions were given on a separate paper and students were given the opportunity to read the correct answers only after submitting the completed trivia questions. *Id.* at 117–18. The experiment tested how many participants cheated by reading the correct answers before submitting the trivia questions and adjusted for different levels of certainty by varying the presence of the proctor in the room. *Id.* at 118. A high-risk, high-certainty setting was created by placing a proctor in particular rooms for the entire duration of the response process. *Projected Offending*, *supra* at 118. "[R]espondents in the high-certainty condition were less likely to cheat." *Id.* at 121 n.9. Additionally, the students that are less likely to cheat are also less likely to drink and drive when certainty of getting arrested is high. *See id.* at 124. However, Pogarsky's study only provides a limited examination of criminal behavior because of the following: the sample consisted of student not criminals; the sanction presented was not severe because getting caught cheating on the trivia questions only meant that the student would not receive a cash bonus; the only illegal behavior accounted for in the study was the drinking and driving which is self-reported and thus speculative. A study performed by Weisburd took Pogarsky's shortcomings into account and created a study where court-ordered financial obligations to groups of parolees were examined. *See* Weisburd, *supra* at 11. Two main groups of parolees were examined: one group belonged to MUSTER, the other group did not. *Id.* at 17. MUSTER is a probation program designed to increase the effectiveness of probationer payment of fine sanctions through legal means. *Id* at 14–15. MUSTER poses the threat of community service and incarceration when fees are not paid. *Id.* Additionally, the certainty of sanctions is high because member of MUSTER receive a more intensive probation than other parolees. *See id.* The study found that parolees that are members of MUSTER are significantly more likely to pay court-ordered fines than other parolees. *Id.* at 27.

179. *See* Ronald L. Akers, *Rational Choice, Deterrence, and Social Learning Theory in Criminology: The Path Not Taken*, 81 J. CRIM. L. & CRIMINOLOGY 653, 655 (1990). Theories of deterrence and rational choice are both incomplete models of criminal behavior that should be used together to properly explain crime. *Id.* The balancing test between rewards and cost, which is the central concept of rational choice theory, is compatible with social learning theory. *See id.* Social forces create the behavioral incentives and disincentives. *See id.*

180. *See id.* at 655–57 (arguing that theories of deterrence, rational choice and social learning all coincide).

181. *See* SAMAHA, *supra* note 31, at 90.

182. MARSHALL B. CLINARD & ROBERT F. MEIER, SOCIOLOGY OF DEVIANT BEHAVIOR 105 (Erin Mitchell et al. eds., 14th ed. 2011) (giving a chart which illustrates the tenets of differential association).

and peers create a subjective understanding of the positive and negative effects of crime.[183]

Although insufficient research has been performed to conclusively determine whether DNA databases may deter crime,[184] some may argue that the presence of DNA databases decreases crime in the same way that police presence decreases driving speed.[185] As DNA databases are used by law enforcement, citizens will become increasingly aware of the substantial certainty of being identified by DNA forensics.[186] This knowledge can dissuade potential offenders from committing crimes because they will know that the likelihood of receiving a negative sanction is high.[187] The positive effects associated with the crime are not likely to warrant the risk.[188]

An ethnographic study consisting of twenty-six volunteer inmates examined the extent of prisoners' knowledge of DNA forensics.[189] The study showed that prisoners were familiar with the power of DNA forensics.[190] Although the prisoners did not have a sophisticated knowledge of how DNA forensics works, most of the prisoners believed that DNA forensics is very effective and extremely difficult to avoid.[191]

183. Ronald L. Akers & Wesley G. Jennings, *The Social Learning Theory of Crime and Deviance*, *in* HANDBOOK ON CRIME AND DEVIANCE, 105–06 (Marvin D. Krohn et al. eds., 2009).

184. Jennifer L. Doleac, *The Effects of DNA Databases on Crime* 25 (Stanford Inst. for Econ. Policy Research, Working Paper No. 12-002, 2011) ("Though DNA databases have great potential – and, anecdotally, much success – there has been little rigorous analysis of their impact on criminal behavior or crime rates.").

185. *Cf.* BENEKOHAL, *supra* note 174.

186. *See* COLE, *supra* note 25, at 65 (stating that modern society is aware of the use of fingerprints). Fingerprinting and anthropometry, measurement of the human body, are means of identifying criminals, which have been used since the late nineteenth century. *Id.* The use of these biometric criminal identifiers shows that society may become aware of the use of a particular means of identification when it is consistently used for a prolonged amount of time. *Id.* Fingerprints are well known today because they are commonly used during arrest procedure. *Id.* Anthropometry is unknown because law enforcement ceased to use it at beginning of the twentieth century. *Id.* If DNA is consistently used for a prolonged amount of time by law enforcement to identify criminals, the public may be as familiar with it as they are with fingerprints. *Id.*

187. *See* VITO & MAAHS, *supra* note 170, at 51.

188. *See id.*

189. *See* Barbara Prainsack & Martin Kitzberger, *DNA Behind Bars: Other Ways of Knowing Forensic DNA Technologies*, 39 SOC. STUD. OF SCI. 51, 54–55 (2009).

190. *See id.* at 52.

191. *Id.* at 65. Most of the prisoners in the study did not have scientific knowledge about DNA, but acquired practical knowledge through association with peers. *Id.* For example, one of the interviewees had accidentally gotten blood on the floor during a burglary. *Id.* With no time to clean the floor, the burglar poured milk on the blood. *Id.* Milk contaminates DNA so that it is unreadable, a trick that the burglar learned from his peers. Prainsack & Kitzberger, *supra* note 189, at 65.

Prisoners knew that even a small amount of blood, hair, or saliva can render a readable DNA sample.[192]

The interviews with the prisoners show that the rational choice argument should not be given credence.[193] According to rational choice theory, the prisoners in the study should have been deterred from committing their respective crime because they were aware of the high likelihood of arrest posed by DNA forensics.[194] However, these prisoners were obviously not deterred from committing crime.[195] The study states that the interviewees did not consider DNA as a particularly important factor in the decision to commit a crime.[196] This incongruous outcome may be explained by the fact that potential offenders may doubt the certainty of arrest posed by DNA forensics.[197] This doubt can be reasonably inferred from the fact that potential offenders believe that steps can be taken to successfully avoid leaving DNA evidence at crime scenes.[198] Criminals attempt to avoid leaving DNA at crime scenes in a variety of ways.[199] Rapists have avoided leaving post-coital DNA by wearing condoms or forcing victims to bathe after an attack.[200] Additionally, criminals refrain from spitting or leaving cigarette butts at the site of a crime.[201] Thus, DNA databases may not successfully deter crime because potential offenders may have a lowered perception of the certainty of being apprehended by DNA identification.[202]

The lowered perception of certainty may be a result of the social aspects of crime.[203] Criminal associations facilitate the diffusion of methods to avoid leaving DNA at crime scenes.[204] As criminals share successful experiences on how to avoid leaving DNA at crime scenes, potential offenders gain the subjective understanding that DNA forensics is surmountable.[205]

192. *Id.* at 64.
193. *See id.* at 62.
194. *See* VITO & MAAHS, *supra* note 170, at 51.
195. *See* Prainsack & Kitzberger, *supra* note 189, at 62.
196. *Id.*
197. *See* ALAN MARZILLI, POINT/COUNTERPOINT: DNA EVIDENCE 109 (2005).
198. *Id.*
199. *Id.*
200. *Id.*
201. *Id.*
202. *See* VITO & MAAHS, *supra* note 170, at 51.
203. *See* CLINARD & MEIER, *supra* note 182.
204. *Id.*
205. *Id.*

DNA databases may exacerbate crime among particular groups instead of causing deterrence.[206] When a young offender is convicted of a crime, his or her DNA profile is uploaded into the database and will remain in the database for the duration of his or her life.[207] The presence of young offender profiles will ensure that law enforcement can quickly apprehend any young recidivists when another crime is committed.[208] This can be damaging because consistent incarceration at a young age will force offenders to have frequent and intimate association with other convicted criminals.[209] This experience may cause the young offender to further develop definitions that favor the violation of the law, which can turn young individuals into hardened criminals by potentially severing any hope of rehabilitation and dooming the youngster to a life of crime.[210] Thus, DNA databases may not substantially deter crime nor provide rehabilitative effects.[211]

III. THE COSTLY EFFECTS OF COLLECTING DNA FROM ALL ARRESTEES

The conclusion that DNA databases do not deter crime nor provide rehabilitative effects should not be implied to suggest that DNA forensics is not a valuable and useful tool.[212] DNA databases still remain useful because they allow police to quickly identify and apprehend dangerous criminals.[213] DNA forensics mainly provide law enforcement with a

206. *See* Doleac, *supra* note 184, at 25.

207. *See* Michelle Hibbert, *DNA Databanks: Law Enforcement's Greatest Surveillance Tool?*, 34 WAKE FOREST L. REV. 767, 777–78 (1999).

208. *See* Doleac, *supra* note 184, at 25.

209. *See* FRANK E. HAGAN, INTRODUCTION TO CRIMINOLOGY: THEORIES, METHODS, AND CRIMINAL BEHAVIOR 159 (Jerry Westby et al. eds., 6th ed. 2008); *See* CLINARD & MEIER, *supra* note 182. The theory of differential association asserts that social groups may have influence on an individual according to frequency, duration, intensity, and priority of exposure to the group. HAGAN, *supra* at 160. The frequency of contact refers to the number of contacts that an individual maintains with a specific group. *Id.* The duration of contact is the length of time that an individual is exposed to a specific group. *Id.* The priority given to a group depends on an individual's expression of preference toward the group's values. *Id.* The intensity of a contact is the degree of meaning that the actor attaches to the group's values. *Id.* The likelihood that an individual will engage in illegal behavior is increased when the individual associates with a group that has values which favor illegal behavior and the aforementioned factors are high in relation to that group. CLINARD & MEIER, *supra* note 182.

210. Doleac, *supra* note 184, at 25–26.

211. *See supra* Part II.

212. Morrissey, *supra* note 169 (claiming that the use of DNA forensics is a very effective investigatory tool).

213. Doleac, *supra* note 184. *See generally* WAYNE R. LAFAVE, CRIMINAL LAW 27 (4th ed. 2003).

function of restraint and incapacitation.[214] However, instating a criminal justice system where DNA is collected from all arrestees is not a cost-efficient use of the function of DNA databases because of the social implications that may be involved.[215] The costs involved with analyzing DNA varies given the circumstances of the testing.[216] Processing the DNA of an arrestee that has been collected during an arrest procedure can cost anywhere from $25 to $110 dollars.[217] Analyzing the DNA found at crime scenes can be more expensive.[218] Testing the post-coital DNA of an unnamed rape suspect can cost about $1,000 dollars.[219] Laboratories are currently struggling to analyze all the DNA samples that are submitted from law enforcement.[220] Collecting samples from every arrestee would substantially increase the demand of DNA forensics and aggravate the backlogs of many laboratories.[221] A backlog is a situation where a laboratory is overburdened and cannot test all of the samples that have been submitted.[222] Submitting a slew of arrestee samples to overburdened

214. *See* LAFAVE, *supra* note 213. Restraint is a theory of punishment, which claims that society must protect itself from individuals with past criminal conduct by isolating them from society. *Id.* Critics of restraint theory have argued that restraint without rehabilitation is misguided because most prisoners will ultimately return to society. *Id.*

215. *See Interview with Sheldon Krimsky and Tania Simoncelli, Authors of Genetic Justice: DNA Data Banks, Criminal Investigations, and Civil Liberties*, COLUMBIA UNIVERSITY PRESS, ht tp://www.cup.columbia.edu/static/interview-krimsky-simoncelli (last visited Oct. 22, 2013) [hereinafter *Interview with Krimsky & Simoncelli*].

216. THE NAT'L CTR. FOR VICTIMS OF CRIME, DNA & CRIME VICTIMS: WHAT VICTIM ASSISTANCE PROFESSIONALS NEED TO KNOW 7 http://www.victimsofcrime.org/docs/Resource %20Library/DNA%20PROVIDER%20bro.pdf (last visited June 3, 2014).

217. NORTH CAROLINA OFFICE OF STATE BUDGET AND MGMT., COST STUDY OF DNA TESTING AND ANALYSIS 8 (2006). A survey distributed among forty-nine states found that the cost of processing DNA samples into offender profiles varies among states. *Id.* The DNA samples processed at private laboratories in South Carolina and Tennessee cost twenty-eight dollars per sample. *Id.* at 7. Private laboratories in Utah spend fifty-four dollars per sample. *Id.* Public laboratories tend to run up higher costs than private laboratories. *Id.* at 7–8. In Iowa, public laboratories process DNA samples at $110 dollars per sample. *Id.* at 8.

218. *See* THE NAT'L CTR. FOR VICTIMS OF CRIME, *supra* note 216.

219. Becca Aaronson, *Bill to Test Rape Kits Comes With Big Price Tag*, THE TEXAS TRIBUNE (Apr. 26, 2011), http://www.texastribune.org/2011/04/26/bill-to-test-rape-kits-comes-with-big-pri ce-tag/.

220. *See id.* (discussing the difficulties facing Texas laboratories where over 22,000 DNA rape samples have yet to be analyzed); *see also* MARK NELSON, U.S. DEP'T OF JUSTICE, OFFICE OF JUSTICE PROGRAMS, NCJ 232197, MAKING SENSE OF DNA BACKLOGS, 2010—MYTHS VS. REALITY 5 (2011), https://www.ncjrs.gov/pdffiles1/nij/232197.pdf.

221. NELSON, *supra* note 220, at 1.

222. *Backlogs of Forensic DNA Evidence*, NAT'L INST. OF JUST., http://www.nij.gov/topics/fo rensics/lab-operations/evidence-backlogs/welcome.htm (last modified Aug. 12, 2010). The term backlog does not have a ubiquitous definition. *Id.* Laboratories use the term in different ways to describe delays in the processing of DNA samples. *Id.* Some laboratories suggest that a backlog occurs whenever a DNA sample has not been analyzed. *Id.* Other laboratories wait as much as

laboratories will exacerbate laboratory backlogs and costs states a great deal of money.[223]

The costs associated with analyzing the DNA of every arrestee would make database expansion a situation of diminishing returns.[224] Increasing the number of DNA profiles in databases would not increase the effectiveness and efficiency with which law enforcement can incapacitate criminals.[225] The current limitation on DNA forensics is not caused by the scarcity of profiles in databases.[226] The hindrance placed on the use of DNA evidence is the difficulty involved with detecting and collecting DNA from crime scenes.[227] Expanding the categories of individuals included in the database would simply increase the presence of DNA profiles that are less likely to be associated with the kind of crimes where DNA is relevant.[228] Thus, the large costs associated with analyzing the DNA of all arrestees is not justified because such analysis will not increase the effectiveness of DNA forensics.[229]

IV. A PROPOSAL TO LIMIT DNA COLLECTION TO SERIOUS OFFENDERS

Each state should deny legislation that would enact a database where DNA is collected from all arrestees because such legislation would create a

thirty to ninety days without having analyzed DNA to declare a backlog. *Id.*

223. NELSON, *supra* note 220 (cautioning that large submissions of DNA samples to laboratories may have serious impacts on DNA backlogs because the submissions could cause large increases in the laboratory workload); s*ee* HOWARD N. SNYDER, ARREST IN THE UNITED STATES, 1990-2012 2 (2012), http://www.bjs.gov/content/pub/pdf/aus9010.pdf; NORTH CAROLINA OFFICE OF STATE BUDGET AND MGMT., *supra* note 217; THE NAT'L CTR. FOR VICTIMS OF CRIME, *supra* note 216, at 1; *Alcohol and Crime: Data From 2002 to 2008*, BJS, http://www.bjs.gov/content/acf/9_most_serious_offense.cfm (last updated July 28, 2010). In 2010, there were over three million arrests for the following offenses: driving under the influence; violation of liquor laws; drunkenness; and disorderly conduct. SNYDER, *supra*. If DNA samples were taken during the arrests, processing the samples would have cost states at least $75 million dollars. *See* NORTH CAROLINA OFFICE OF STATE BUDGET AND MGMT., *supra* note 217. The three million samples would have exacerbated laboratory backlogs because such a large amount of samples submitted in the course of one year would substantially increase the laboratory workload. NELSON, *supra* note 220, at 5. Additionally, the majority of these samples will not serve any purpose because DNA evidence is most commonly used in sexual crimes and homicide. THE NAT'L CTR. FOR VICTIMS OF CRIME, *supra* note 218, at 1. There is no correlation to suggest that people who are prone to drinking and driving are likely to commit sexual crimes or homicide. *Alcohol and Crime: Data From 2002 to 2008*, *supra*.

224. *Interview with Krimsky & Simoncelli*, *supra* note 215.

225. *Id.*

226. *Id.*

227. *Id.*

228. *Id.*

229. *See id.*

situation of diminishing returns.[230] State law should limit DNA collection to arrestees that are charged with serious crimes.[231] For the purposes of the regulation, serious crimes should include all crimes where DNA evidence is particularly useful.[232] DNA evidence is useful in investigating the following: homicide; sexual crimes; assault; burglary; and theft.[233] Such legislation would allow law enforcement sufficient leeway to exercise the power of DNA forensics and would only require the analysis of a reasonable amount of DNA samples.[234] Limiting the analysis of arrestee DNA to a reasonable number of samples would ensure that investigations are performed in a cost-efficient manner.[235]

The denial of over-inclusive databases would not be happily invited by all states because some states are stern proponents of DNA database expansion.[236] Passing the proposal as a federal statute would be ideal because it would ensure uniformity among all states.[237] However, the enumerated powers given to Congress by the Constitution may prevent any federal legislation pertaining to the arrest procedure of sexual crimes or homicide.[238] The Federal Government may be limited in its ability to instill

230. *See supra* Part III.

231. *See, e.g.,* MD. CODE ANN. PUB. SAFETY § 2-504(a)(3)(i) (LexisNexis 2013)*; see supra* Part III. *See generally* David Lazer & Michelle N. Meyer, *DNA and the Criminal Justice System: Consensus and Debate*, *in* DNA AND THE CRIMINAL JUSTICE SYSTEM: THE TECHNOLOGY OF JUSTICE 357, 372–73 (David Lazer ed., 2004) (listing states' criteria in order to be included in its individual databases). Currently, the Maryland legislature only allows DNA collection from individuals charged with serious crimes. Section 2-504(a)(3)(i), *supra*. Most states are like Maryland and have adopted similar legislation, which only allows collection from arrestees charged with violent crimes. Lazer & Meyer, *supra*. States should not adopt a more inclusive legislation that expands collection of DNA samples to include collection from all arrestees. *Supra* Part III.

232. *See* THE NAT'L CTR. FOR VICTIMS OF CRIME, *supra* note 216, at 1.

233. *See id.*

234. *See* NORTH CAROLINA OFFICE OF STATE BUDGET AND MGMT., *supra* note 217.

235. *See* NELSON, *supra* note 220; *supra* Part III.

236. *See* Morrissey, *supra* note 169. Mitch Morrissey is one of the nation's most enthusiastic advocates for the use DNA forensics. *Id.* Morrissey has convinced the FBI to release partial DNA matches rendered from the CODIS database. *Id.*

237. *E.g.*, U.S. DEP'T OF HOMELAND SEC., LEGAL GUIDANCE ON CRIMINAL HISTORY RECORDS CHECKS 3 (2004).

238. *See* U.S. CONST. art. I, § 8, cl. 3; United States v. Morrison, 529 U.S. 598, 617 (2000); Lainie Rutkow & Jon S. Vernick, *The U.S. Constitution's Commerce Clause, the Supreme Court, and Public Health*, 126 PUB. HEALTH REP. 750, 750 (2011), *available at* http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3151195/. The Commerce Clause is one of the largest powers given to Congress by the Constitution. Rutkow & Vernick, *supra*. It allows Congress to "regulate commerce . . . among the several States." U.S. CONST. art. I, § 8, cl. 3. However, federal regulation of the collection of DNA samples from arrestees charged with homicide or sexual crimes would not be justified under the commerce clause. *Morrison*, 529 U.S. at 617. The Supreme Court is likely to "reject the argument that Congress may regulate noneconomic, violent criminal conduct based solely on that conduct's aggregate effect of interstate commerce." *Id.*

the proposed regulation, but may entice states to cooperate.[239] Regulating the collection of DNA to serious offenders can be made a condition to receiving federal grants for DNA initiatives.[240] The National Institute of Justice ("NIJ") awards states with grants for the improvement of DNA forensic laboratories.[241] In 2009, the NIJ awarded over $3 million dollars in grants to six states.[242] The NIJ is currently funding a $65 million dollar initiative to reduce the backlog of laboratories.[243] The grants issued by the NIJ have requirements for acceptance.[244] Thus, the NIJ can easily attach the proposed regulation as a requirement for acceptance of grants.[245]

V. CONCLUSION

DNA forensics is an incredibly powerful tool that allows law enforcement to efficiently identify and incapacitate dangerous criminals.[246] This technology allows law enforcement to link individuals to unsolved crime scenes with the click of a button.[247] If DNA evidence is insufficient to link an individual to a crime scene, investigators can perform nonconsensual DNA searches of genetic profiles that are substantially similar to that of the suspect.[248] The current use of DNA in law enforcement creates profound results for crime solving.[249] These profound results may incite states to expand the profiles in DNA databases in hopes of rendering more effective searches.[250] However, such an expansion would create a situation of diminishing returns because DNA forensics is currently limited by the ability to collect DNA from crime scenes, not by the number of profiles in databases.[251] Thus, states should only collect the

239. *See Morrison*, 529 U.S. at 617.

240. *See Laboratory Enhancement Funding*, NAT'L INST. OF JUST., http://www.nij.gov/funding/laboratory-enhancement.htm (last visited Oct. 24, 2013) (listing ten federal programs that have awarded funds to state laboratories which process and analyze DNA samples).

241. *Id.*

242. U.S. DEP'T OF JUSTICE, DNA LABORATORY EFFICIENCY PROGRAM: FISCAL YEAR 2009 AWARDS AND ABSTRACTS 2, http://www.nij.gov/topics/forensics/lab-operations/capacity/documents/dna-unit-efficiency-abstracts-fy09.pdf (last visited June 3, 2014).

243. *See* U.S. DEP'T OF JUSTICE, SOLICITATION: FY 2010 FORENSIC DNA BACKLOG REDUCTION PROGRAM 4 (2010), https://www.ncjrs.gov/pdffiles1/nij/sl000871.pdf.

244. *See generally Other Requirements for OJP Applications*, OFFICE OF JUSTICE PROGRAMS, http://www.ojp.usdoj.gov/funding/other_requirements.htm (last visited Feb. 13, 2014).

245. *See id.*

246. Etzioni, *supra* note 9.

247. *Id.*

248. *See* Nakashima, *supra* note 151.

249. Etzioni, *supra* note 9.

250. *See* Maryland v. King, 133 S. Ct. 1958, 1989 (2013) (Scalia, J., dissenting).

251. *Interview with Krimsky & Simoncelli*, *supra* note 215.

DNA profiles of serious offenders.[252] Such a regulation would ensure that law enforcement would utilize the powerful search tool of DNA in a financially responsible manner.[253]

252. *See supra* Part IV.
253. *See supra* Part III.