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Touch DNA and Chemical Analysis of Skin Trace Evidence: Protecting Privacy While Advancing Investigations

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TOUCH DNA AND CHEMICAL ANALYSIS OF SKIN TRACE EVIDENCE: PROTECTING PRIVACY WHILE ADVANCING INVESTIGATIONS

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INTRODUCTION

Forensic science[1] transforms criminal investigations by resolving previously unsolvable cases and bringing an increased sense of justice to communities. This application of scientific disciplines to legal questions aids investigators in solving crimes. While many sciences can be utilized—such as physics (pattern evidence), chemistry (toxicology), or biology (cause of death), to name a few—two aspects of scientific advancement have played an outsized role in responding to crime. Trace evidence analysis—specifically, deoxyribonucleic acid (DNA) analysis—is an essential component to an effective and accurate criminal justice system. DNA evidence has emerged as a powerful tool to identify perpetrators of unspeakable crimes and to exonerate innocent individuals accused of similarly heinous actions. Additionally, the advent of new technologies has offered investigators enhanced capabilities to monitor suspects and to learn much more about them than previously imagined.[2] Consequently, much legal scholarship has focused on the intrusive nature of these mainly digital technologies and their implications on privacy.[3]

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[1] The National Institute of Justice defines "forensic science" as "the application of sciences such as physics, chemistry, biology, computer science and engineering to matters of law." *Forensic Sciences*, NAT'L INST. JUST., https://www.nij.gov/topics/forensics/Pages/welcome.aspx [https://perma.cc/DE56-7D87] (last visited Dec. 4, 2017).

[2] *See* Steven M. Bellovin et al., *It's Too Complicated: How the Internet Upends* Katz*,* Smith*, and Electronic Surveillance Law*, 30 HARV. J.L. & TECH. 1, 4–5 (2016) (tracing the origins of police surveillance of telephone calls to IP-mediated communications, such as the Internet).

[3] *E.g.*, R. Craig Curtis et al., *Using Technology the Founders Never Dreamed Of: Cell Phones as Tracking Devices and the Fourth Amendment*, 4 U. DENV. CRIM. L. REV. 61, 63 (2014) (criticizing how law enforcement uses electronic devices to track suspects and how the current Fourth Amendment jurisprudence is inadequate); Jennifer Daskal, *The Un-Territoriality of Data*, 125 YALE L.J. 326, 379 (2015) (discussing the overbroad surveillance powers that law enforcement has when applying territoriality doctrine to electronic data and its effect on privacy); Scott R. Peppet, *Regulating the Internet of Things: First Steps Toward Managing Discrimination, Privacy, Security, and Consent*, 93 TEX. L. REV. 85, 129 (2014)

While scholars debate these hardware and software advances, a different method of examining traditional trace evidence has quietly grown somewhat unnoticed. The emergence of so-called "touch-DNA" evidence and chemical analysis of skin traces represents powerful, novel uses of trace evidence that have significant implications for personal privacy.[4] Furthermore, these abilities are developing within an outdated DNA jurisprudence that is wholly inadequate to protect individual privacy and facilitate the legitimate government interest in accurately investigating crime. Just as beeper and antiquated cell phone jurisprudence was an inadequate framework for the issues arising from smartphones or GPS tracking, DNA jurisprudence has failed to keep pace with modern uses of DNA. Traditional DNA jurisprudence rests on the assumption that the alleles examined reveal only identification traits, and nothing else about the person.[5] But the new advancements of touch DNA and related technologies have the potential to reveal significantly more about the source of the DNA, undermining the very basis of the law regarding DNA's use in criminal investigation.

This Article addresses touch DNA, chemical analysis of skin traces, and the implications for crime scene investigation, arguing that changes in how trace evidence is analyzed require alterations in the law's approach to its use. Part I discusses the history of traditional DNA analysis. Part II examines the emergence of touch DNA and related technologies and how they differ from traditional DNA analysis. Part III outlines the specific risks created by the collection and storing of results under the current outdated jurisprudence. Part IV focuses on specific risks to suspects and victims of crime. Part V proposes a legal framework to address these potentially powerful tools and their threat to privacy. In so doing, this Article proposes drawing a distinction between the collection of DNA and cellular materials for identification purposes and a subsequent examination of these materials for other information about the source. The framework adopted by the Supreme Court for cell phone examination in *Riley v. California*,[6] required a more specific level of suspicion to examine the contents of a cell phone than to obtain it incident to arrest.[7] This Article advocates utilizing this framework in the collection and examination of the even more personal information contained within DNA and cellular evidence. Specifically, it distinguishes between collecting the evidence and routinely testing it for

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(discussing how individualized inferences received from smartphone data create a legal problem for which privacy law is unprepared).

[4] *See generally* Khalid Mahmud Lodhi et al., *Generating Human DNA Profile(s) from Cell Phones for Forensic Investigation*, 6 J. FORENSIC RES. 288 (2015) (explaining that when a person touches an object, epithelial cells are deposited and subsequently can be traced).

[5] *See* United States v. Kincade, 379 F.3d 813, 818 (9th Cir. 2004) (recounting testimony that the alleles examined "were purposely selected because they are not associated with any known physical or medical characteristics" (citation omitted)).

[6] 134 S. Ct. 2473 (2014).

[7] *Id.* at 2493 (holding that officers must generally secure a warrant before searching the contents of a cell phone, even when the cell phone is seized incident to arrest).

identity and the more invasive examination of the evidence for additional personal information about the source. Before searching this deeply into this evidence for any information beyond identification, the government must establish a higher level of suspicion and obtain a warrant.

I. TRADITIONAL DNA ANALYSIS

The science of investigating crimes has evolved over centuries. As new technologies developed in various industries, law enforcement also adopted these techniques. What once involved police surveillance by physically following a suspect now involves cyber surveillance and drones. Contemporary disciplines, such as behavioral profiling,[8] cyber investigations,[9] and advanced interview techniques,[10] were unheard of in early police departments. Nowhere are these advancements more apparent than in crime scene investigation.

In early law enforcement investigatory practices, the crime scene's value was predominantly in its visual corroboration of a victim's testimony.[11] A scene of disarray corroborated the claim of a scuffle, the presence of twine supported a claim of restraint, and a broken window provided a clue regarding an intruder's mode of entry into a home. However, placing an individual at the scene of a crime usually required eye witness testimony. In the case of a homicide, this was often impossible. Even with a victim able to testify, difficulty in identifying a perpetrator, trauma, or credibility battles between victims and defendants posed significant obstacles to reaching the beyond a reasonable doubt standard of a criminal prosecution.

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[8] J. Amber Scherer & John P. Jarvis, *Criminal Investigative Analysis: Practitioner Perspectives (Part One of Four)*, FBI L. ENFORCEMENT BULL. (June 10, 2014), https://leb.fbi.gov/articles/featured-articles/criminal-investigative-analysis-practitioner-perspectives-part-one-of-four [https://perma.cc/8L6S-C7NF] (stating that since the 1970s, the FBI has practiced behavioral profiling by analyzing crime scenes and providing behavioral and personality traits of a possible offender).

[9] Catherine D. Marcum et al., *Policing Possession of Child Pornography Online: Investigating the Training and Resources Dedicated to the Investigation of Cyber Crime*, 12 INT'L J. POLICE SCI. & MGMT. 516, 517 (2010) (stating that some law enforcement agencies are devoting additional resources to combat cyber crime).

[10] Lori H. Colwell et al., *The Training of Law Enforcement Officers in Detecting Deception: A Survey of Current Practices and Suggestions for Improving Accuracy*, 9 POLICE Q. 275, 276 (2006) (describing which interview techniques yield the most success).

[11] *See* JOSEPH PETERSON ET AL., NAT'L INST. OF JUSTICE, THE ROLE AND IMPACT OF FORENSIC EVIDENCE IN THE CRIMINAL JUSTICE PROCESS 1, 19, 23, 103, 123 (2010), https://www.ncjrs.gov/pdffiles1/nij/grants/231977.pdf [https://perma.cc/3A9T-GA7W] (stressing the importance of evidence-gathering in corroborating information gathered from witnesses, victims, or suspects). The authors cite a study finding prosecutors more likely to file charges if a rape victim was physically injured, because "[t]he victim may be deemed more believable if she has injuries that can corroborate her assertion that the intercourse was nonconsensual." *Id.* at 103.

However, the evolution of trace evidence transformed criminal investigations. Trace evidence can include traces collected from clothes, textiles, hair, or other fibers that can inform investigators about who was present at a crime scene and provide further information on what occurred.[12] As law enforcement began to understand the value in learning the source of trace evidence, investigators began to look for visual signs of trace evidence, such as visible blood spattering, shoe prints, tire tracks, or semen stains. While helpful, such evidence was not always determinative.[13] This could be due to the nature of the evidence—for example, a tire track is helpful but not unique enough to demonstrate definitively the presence of a suspect's vehicle; the presence of type-O blood can narrow possible suspects, but it does not establish the presence of a certain individual. The diminished quality of evidence also could impact the strength of trace evidence as well. For example, a partial fingerprint or a degraded sample of biological fluid may add little to the evidence in a given case.

However, the collection of evidence at crime scenes changed radically in the 1990s when Restriction Fragment Length Polymorphism (RFLP) DNA profiling allowed for the testing of DNA on the molecular level.[14] The earliest use of DNA testing in the legal setting occurred in the 1980s.[15] This presented a significant improvement in sensitivity for testing and was used primarily to link a suspect to the scene of the crime.[16] In its early years, this method still required at least a visible or somewhat detectable sample size.

Within ten years, the technology advanced to Polymerase Chain Reaction (PCR) based short tandem repeat (STR) testing.[17] This system multiplies a single copy of a DNA segment to allow for the analysis of the genetic makeup of a small sample.[18] Current analysis makes it "possible to determine whether a biological tissue matches a suspect with near certainty."[19] DNA is comprised of "coding" and "non-coding"

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[12] *See* Amina Bouslimani et al., *Lifestyle Chemistries from Phones for Individual Profiling*, 113 PROC. NAT'L ACAD. SCI. E7645, E7645 (2016).

[13] *See* Joe Minor, *Touch DNA: From the Crime Scene to the Crime Laboratory*, FORENSIC MAG. (Apr. 12, 2013, 6:27 AM), https://www.forensicmag.com/article/2013/04/touch-dna-crime-scene-crime-laboratory [https://perma.cc/W6C3-FWTP].

[14] *Id.*

[15] EDWARD CONNORS ET AL., U.S. DEP'T OF JUSTICE, CONVICTED BY JURIES, EXONERATED BY SCIENCE: CASE STUDIES IN THE USE OF DNA EVIDENCE TO ESTABLISH INNOCENCE AFTER TRIAL 4 (1996) (stating that the first use of DNA in a criminal case was in 1987 in England to corroborate a confession for two rape-murders); Edward J. Imwinkelried & D.H. Kaye, *DNA Typing: Emerging or Neglected Issues*, 76 WASH. L. REV. 413, 413 n.1 (2001) (referring to positive identification of a young immigrant boy seeking entrance into the United Kingdom); *see also* Debra Cassens Moss, *DNA—The New Fingerprints*, 74 A.B.A. J. 66, 68 (1988).

[16] *See* Jones v. Murray, 962 F.2d 302, 307 (4th Cir. 1992) (describing DNA as a "dramatic new tool"); Imwinkelried & Kaye, *supra* note 15, at 415.

[17] Minor, *supra* note 13; *see* Andrews v. State, 533 So. 2d 841 (Fla. Dist. Ct. App. 1988); 2 PAUL C. GIANNELLI ET AL., SCIENTIFIC EVIDENCE § 18.05[a][1] (5th ed. 2012 & Supp. 2017).

[18] *See* Lodhi et al., *supra* note 4.

[19] Maryland v. King, 133 S. Ct. 1958, 1967 (2013) (citation omitted).

regions.[20] The loci examined are found on "junk DNA," which are segments of the DNA not known to code for any specific trait, but known to be different between individuals.[21] "Junk DNA" are the non-coding regions which contain valuable information about identity, but do not contain information regarding coding for other genetic traits.[22] This allows the development of a DNA profile without an examination into other genetic markers.[23]

As DNA analysis developed, it required a much smaller and, at times, barely visible sample.[24] It improved the ability of DNA evidence to even more precisely determine the identity of the source of the DNA evidence.[25] Once the DNA profile of the source is generated, it is often compared with known sources to determine if it matches the known person.[26] The precision of the DNA test is so clear that "the chance that two randomly selected individuals will share the same profile are infinitesimal—as are the chances that a person randomly selected from the population at large will present the same DNA profile as that drawn from crime-scene evidence."[27] Thus, the sample is often compared for a match to the FBI's Combined DNA Index System (CODIS), which is an enormous collection of DNA records.[28] Such a comparison can identify a prior felon as the source of crime scene DNA.[29]

DNA at a crime scene can be connected with an eventual defendant in several ways. DNA samples are often collected from an individual either because of his status as an arrestee,[30] convicted felon,[31] or as a suspect in an investigation. That profile is compared with the profile of DNA left at a crime scene. If the genetic profiles match, then it places the individual at the location of the crime. A typical example involves the use of the CODIS. Most states allow for the collection of DNA samples from convicted offenders and certain arrestees or convicted persons.[32] When a

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[20] *Id.* at 1966–67.

[21] United States v. Kincade, 379 F.3d 813, 818 (9th Cir. 2004).

[22] *King*, 133 S. Ct. at 1967.

[23] *See Kincade*, 379 F.3d at 818.

[24] Minor, *supra* note 13.

[25] *See generally* JAY D. ARONSON, GENETIC WITNESS: SCIENCE, LAW, AND CONTROVERSY IN THE MAKING OF DNA PROFILING 8–21 (2007).

[26] *See id.* at 21–30.

[27] *Kincade*, 379 F.3d at 819 (citation omitted).

[28] *Id.*

[29] *See id.* at 818–19; Simon A. Cole, *Is the "Junk" DNA Designation Bunk?*, 102 NW. U. L. REV. COLLOQUY 54, 56 (2007). Notwithstanding this vast improvement, DNA continued to be no panacea because of its difficulty to obtain, the possibility of contamination, or inability to identify a source of the DNA because the person is not in a known database.

[30] *See* Maryland v. King, 133 S. Ct. 1958, 1965–66 (2013) (holding the cheek swab of a defendant as part of routine booking procedures for serious offenses reasonable under the Fourth Amendment).

[31] *See Kincade*, 379 F.3d at 837–38 (holding that DNA testing of individuals convicted of certain federal crimes does not violate the Fourth Amendment).

[32] *See, e.g.*, FLA. STAT. § 943.325 (2017) (establishing a statewide database of DNA samples taken from anyone convicted of a felony, convicted of certain misdemeanors, or arrested

biological sample is found at a crime scene, law enforcement will submit it to be compared with samples within the National DNA Database (NDIS), administered by CODIS.[33] This system connects DNA laboratories on the federal, state, and local levels in warehousing DNA samples from arrestees, convicted persons, and crime scenes.[34] If there is a match to a known source, CODIS confirms that match and shares the information with law enforcement, thus linking the known individual with a crime scene.[35] If there is a match to an unknown source, then that provides a lead to the investigators to determine whether the cases are connected by the same perpetrator.[36] In effect, the system "provide[s] a kind of genetic fingerprint, which uniquely identifies an individual, but does not provide a basis for determining or inferring anything else about the person."[37] There are twenty core loci used in the NDIS,[38] and as of July 2017, the system contained 12,965,666 offender profiles and 2,794,000 arrestee profiles.[39] "[L]aw enforcement, the defense bar, and the courts have acknowledged DNA testing's 'unparalleled ability both to exonerate the wrongly convicted and to identify the guilty. It has the potential to significantly improve both the criminal justice system and police investigative practices.'"[40]

This use of DNA has been upheld by the Supreme Court based, in part, on the belief that the loci examined are so-called "junk DNA." As discussed *supra*, this "DNA that differs from one individual to the next and thus can be used for purposes of identification but which was 'purposely selected because [it is] not associated with any known physical or medical characteristics' and 'do[es] not control or influence the expression of any trait.'"[41] That is to say that the loci used to create a profile of the source individual only possess the ability to identify the source, similar

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for a felony); N.C. GEN. STAT. § 15A-266.4 (2017) (mandating that any person who is convicted of a certain crime or who is deemed not guilty by virtue of insanity and institutionalized submit a sample of his DNA to be included in a statewide database); VA. CODE ANN. § 19.2-310.2:1 (2017) (allowing for DNA swabs of any person arrested for committing or attempting to commit a violent felony); *see also* GIANNELLI ET AL., *supra* note 17, § 18.05[a][2].

[33] *See* 42 U.S.C. § 14132 (2012); *Frequently Asked Questions on CODIS and NDIS*, FED. BUREAU INVESTIGATION, https://www.fbi.gov/services/laboratory/biometric-analysis/codis/codis-and-ndis-fact-sheet [https://perma.cc/TS42-6PNJ] (last visited Dec. 4, 2017) [hereinafter *Frequently Asked*].

[34] *See King*, 133 S. Ct. at 1984 (Scalia, J., dissenting).

[35] *Id.*

[36] *See Frequently Asked*, *supra* note 33.

[37] H.R. REP. NO. 106-900(I), at 27 (2000).

[38] *Frequently Asked*, *supra* note 33.

[39] *CODIS-NDIS Statistics*, FED. BUREAU INVESTIGATION, https://www.fbi.gov/services/laboratory/biometric-analysis/codis/ndis-statistics [https://perma.cc/YMX5-3562] (last visited Dec. 4, 2017).

[40] *King*, 133 S. Ct. at 1966 (quoting Dist. Attorney's Office for the Third Judicial Dist. v. Osborne, 557 U.S. 52, 55 (2009)).

[41] United States v. Weikert, 504 F.3d 1, 3–4 (1st Cir. 2007) (alteration in original) (quoting H.R. REP. NO. 106-900(I), at 27 (2000)).

to a fingerprint.[42] As will be discussed *infra*, this legal basis is no longer reality.[43] Prior to discussing the legal justification for DNA, it is necessary to explain touch DNA and related technologies and how they are distinct from traditional DNA.

II. TOUCH DNA AND RELATED TECHNOLOGIES

As discussed *supra*, DNA provided a revolutionary change in crime scene analysis, and this DNA testing continues to evolve.[44] However, from its inception, it was not perfect, and it required a certain minimal amount of material to create a profile.[45] As technology developed, however, the field changed.[46] When police needed a DNA profile from a suspect, they no longer needed a search warrant supported by probable cause to obtain it from a suspect's body.[47] Rather, the emergence of so-called "abandoned" DNA allowed for the creation of a profile without forcibly taking DNA from an individual.[48] "Abandoned DNA" refers to "any amount of human tissue capable of DNA analysis and separated from a targeted individual's person inadvertently or involuntarily, but not by police coercion."[49] For example, DNA found on shed skin cells left behind by individuals is "abandoned" DNA.[50]

A similar advancement occurred in retrieving DNA from objects or crime scenes with the advancement of touch DNA. This technique was developed early in the 2000s and "allows analysis of just 'seven or eight' cells from the outermost layer of skin."[51] Touch DNA is also known as epithelial DNA. It uses the same procedures to examine bodily fluids as traditional DNA uses, but the testing is on these remaining epithelial cells.[52] When an individual touches an object, epithelial cells are often left behind. The amount left behind is often less than 100 picograms and is also called low copy DNA.[53] This is evidence with "no visible staining that would likely contain DNA resulting from the transfer of epithelial cells from the skin to an object."[54]

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[42] *See* Cole, *supra* note 29, at 56.

[43] *See Weikert*, 504 F.3d at 13.

[44] *See supra* Part I. Other forms of DNA testing have continued to evolve, including mDNA, Y-STR, LCN, etc.

[45] *See* ARONSON, *supra* note 25, at 3–5.

[46] *See id.*

[47] *See* Elizabeth E. Joh, *Reclaiming "Abandoned" DNA: The Fourth Amendment and Genetic Privacy*, 100 NW. U. L. REV. 857, 859 (2006).

[48] *See id.*

[49] *Id.*

[50] *See id.* at 858.

[51] *See* United States v. Thomas, 597 F. App'x 882, 884 (7th Cir. 2015) (citing *What Is Touch DNA?*, SCI. AM. (Aug. 8, 2008), http://www.scientificamerican.com/article/experts-touch-dna-jonbenet-ramsey/ [https://perma.cc/F8GN-PADM]).

[52] Victoria Kawecki, Comment, *Can't Touch This? Making a Place for Touch DNA in Post-Conviction DNA Testing Statutes*, 62 CATH. U. L. REV. 821, 828–29 (2013).

[53] Lodhi et al., *supra* note 4.

[54] Minor, *supra* note 13 (emphasis removed).

Because DNA testing has improved so much in sensitivity as well as in extraction and analysis, this touch DNA is now possible, and DNA profiles can be obtained from such small samples.[55]

Advances have also been made in the chemical analysis of traces of skin cells left behind on objects. Examination of a very small amount of these epithelial cells can give the examiner information far beyond identification, including information about one's personal life.[56] This goes beyond genetic information to perhaps aid in creating a composite sketch of possible physical features of a suspect. Such analysis can provide "a complete chemical signature obtained through the chemical analysis of a swab of the personal object [that] might reveal personal habits and enable investigators to develop a composite sketch of a person's lifestyle."[57]

While this would seem the natural progression of DNA and skin trace analysis, it is important to understand the distinction between the abilities of touch DNA and chemical analysis of skin traces and traditional DNA. They are twofold and raise significant issues as to whether the legal framework surrounding traditional DNA analysis is sufficient for this new form. First, touch DNA and related technologies require a sample so small that it is often undetectable to the source person and is available from any item touched by a person.[58] Second, the amount of information that can be learned from these samples is much more intrusive into the private life of the individual.[59] These two features raise significant Fourth Amendment concerns.

A. Touch DNA Can Be Obtained from Minuscule Amounts of Trace Evidence

Touch DNA's success is due to the increased sensitivity of testing techniques that allow detection of molecular traces from the skin.[60] Due to this development, lower amounts of human DNA can be detected and, possibly, a full or partial STR profile can be generated.[61] "Due to its superb sensitivity, mass spectrometry (MS) is a powerful tool widely used for forensic application by providing either molecular or elemental analysis."[62]

For example, researchers conducted an experiment where they swabbed cell phones that had no prior preparation for touch DNA.[63] One third of the phones

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[55] Lodhi et al., *supra* note 4.

[56] *See id.*

[57] Bouslimani et al., *supra* note 12, at E7645–46.

[58] *See, e.g.*, United States v. Quinones, 236 F. Supp. 3d 375, 377–78 (D.D.C. 2017).

[59] *See* Bouslimani et al., *supra* note 12, at E7646 (highlighting the potential of providing insights into the personal habits of an individual).

[60] *See* E. Hanson et al., *Specific and Sensitive mRNA Biomarkers for the Identification of Skin in 'Touch DNA' Evidence*, 6 FORENSIC SCI. INT'L: GENETICS 548, 555–57 (2012).

[61] Lodhi et al., *supra* note 4.

[62] Bouslimani et al., *supra* note 12, at E7645 (citations omitted).

[63] Lodhi et al., *supra* note 4.

produced the full DNA profile for the owner of the cell phone.[64] However, that was not the only result. The testing also produced a partial profile in 28% of the cell phones, and another third of the phones had unknown profiles of others.[65] What this research suggests is that a DNA profile can be obtained from many objects simply touched by an individual.[66] This is a very different situation than the advent of traditional DNA analysis, which focused on bodily fluids left at a crime scene and would likely be related to the crime being investigated.

B. Touch DNA and Related Technologies Reveal Much More Personal Information

The concerns about the potential for DNA testing to lead to significant invasions of privacy have existed for some time.[67] This obviously stems from the concern that one's DNA contains massive amounts of genetic information unique to the individual.[68] A recent version of this legal debate emerged in litigation concerning the DNA Analysis Backlog Elimination Act.[69] This Act allows for the Attorney General to create grants for qualifying states to collect DNA samples from defendants convicted of qualifying state offenses for inclusion in the FBI's NDIS, in addition to the collection from federal offenders who are incarcerated, or who are on parole, probation, or supervised release.[70] Once the bodily fluid is collected, the FBI creates a DNA profile from the sample for the NDIS.[71] Courts upheld this Act, in part because testing was limited to the so called "junk DNA" loci.[72]

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[64] *Id.*

[65] *Id.*

[66] *See id.*

[67] *See, e.g.*, United States v. Weikert, 504 F.3d 1, 16 (1st Cir. 2007); United States v. Kincade, 379 F.3d 813, 843 (9th Cir. 2004) (Reinhardt, J., dissenting); Elizabeth R. Pike, *Securing Sequences: Ensuring Adequate Protections for Genetic Samples in the Age of Big Data*, 37 CARDOZO L. REV. 1977 (2016).

[68] *See* Twila Brase, Opinion, *Congress Has Exposed Patients' DNA to Prying Eyes*, WALL ST. J., Aug. 29, 2017, at A15.

[69] *See* 42 U.S.C. § 14135a (2012).

[70] 42 U.S.C. § 14135a(a)(1)–(2). The Justice for All Act of 2004 permitted the inclusion of DNA from certain indicted people, and the DNA Fingerprint Act of 2006 permitted the inclusion of arrestees' DNA. *See* GIANNELLI ET AL., *supra* note 17, § 18.05[a][2]. CODIS also includes samples from missing persons, crime scenes, and unidentified human remains. *Id.*

[71] *See Frequently Asked*, *supra* note 33.

[72] *Weikert*, 504 F.3d at 12–14; *Kincade*, 379 F.3d at 849–51 (Reinhardt, J., dissenting). This appears to be a relic of the courts' analysis of fingerprints. The Supreme Court has upheld the detention of an individual to obtain fingerprints, in part, on the ground that "[f]ingerprinting involves none of the probing into an individual's private life and thoughts that marks an interrogation or search." Davis v. Mississippi, 394 U.S. 721, 727 (1969).

Although some judges recognize the potential for "junk DNA" to reveal information about an individual's "health, propensity for particular disease, race and gender characteristics, and perhaps even propensity for certain conduct,"[73] courts have found that the overall program strikes the appropriate balance between the government interest and the intrusion into privacy.[74] Other judges have pointed out the additional risk to the privacy rights of family members.[75] They argue the hereditary characteristics within the sample could be utilized against these members.[76] The Ninth Circuit discussed the distinction between DNA and fingerprint evidence—both used for identification—by noting that "DNA stores and reveals massive amounts of personal, private data . . . and the advance of science promises to make stored DNA only more revealing in time."[77] While courts have recognized this concern as legitimate, they have generally not found the concern to outweigh the potential benefits of collection and relatively minor privacy intrusion.[78]

Indeed, with touch DNA and related technologies, the day has come that the government is poised to obtain DNA not only for identification, but also to peruse much more information about sources of evidence. This could mean that much more relevant evidence is collected about the case, but also that information about the source individual's health, personal habits, and life, which have no bearing on the case, are collected as well.

As a positive development, the advancement of touch DNA and chemical analysis of trace skin cells can allow for the discovery of important information about the crime being investigated.[79] For example, from these epithelial cells, investigators may be able to identify the presence of explosives, chemicals, or other relevant information that can assist in identifying or confirming the source of the sample or in what behaviors the source of that evidence was engaged.[80] Such evidence can complement DNA or fingerprints and provide a more complete picture of an individual or a "molecular lifestyle signature" to narrow down the suspects who are the source of the evidence.[81]

However, of greater concern is the information that can be obtained about the health or personal life of the source. Researchers in Great Britain examined the DNA

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[73] *Kincade*, 379 F.3d at 842 n.3 (Gould, J., concurring).

[74] *See, e.g.*, *id.* at 836–39 (majority opinion).

[75] *See id.* at 849 & n.7 (Reinhardt, J., dissenting).

[76] *See id.* at 850.

[77] *Id.* at 842 n.3 (Gould, J., concurring).

[78] The First Circuit noted that this legitimate concern "challenge[d] the core assumption underlying junk DNA's name—regions of DNA previously thought to be 'junk DNA' may be genic after all." United States v. Weikert, 504 F.3d 1, 13 (1st Cir. 2007) (quoting *Kincade*, 379 F.3d at 850 (Reinhardt, J., dissenting)).

[79] Lodhi et al., *supra* note 4.

[80] *See* Bouslimani et al., *supra* note 12, at E7645.

[81] *Id.* at E7652.

fingerprints collected by police and were able to confirm that one of the markers thought to be "junk" actually contained information about a suspect's susceptibility to diabetes.[82] This finding has alarmed some scientists as British police expand their DNA collection programs and more is learned about genetic information.[83] Other research from the Netherlands has developed kits to analyze DNA left at crime scenes that can predict the eye color of the suspects.[84] Others have identified genetic variants for determining racial indicators and facial shaping that could assist in predicting a person's face from a DNA profile.[85] This information is not limited to medical information, but includes information regarding one's personal life as well.[86]

Chemical analysis of trace skin poses further risks. Such analysis of epithelial cells can reveal medical information about the source, including his susceptibility to certain diseases,[87] drug use, medications being taken (which may indicate medical conditions), and the presence of caffeine, certain products, or illicit drugs.[88]

While some of this may appear to be minor information regarding hygiene, other such information can be very private. Researchers have conducted experiments to determine how much information they could learn about a person's lifestyle by analyzing the chemical skin traces on their phones.[89] Importantly, the goal of this research was not to determine identity, but to determine lifestyle information regarding the individual whose skin made contact with the object.[90] The results of this research included finding distinct lifestyle indicators even four months after the source engaged in the activity.[91] These included information regarding medications, hygiene products, and diet.[92] The medications included not just topical skin medication, but also medications or drugs consumed and later secreted, including anti-depressants.[93]

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[82] David Concar, *Fingerprint Fear*, NEW SCIENTIST (May 2, 2001), https://www.newscientist.com/article/dn694-fingerprint-fear/ [https://perma.cc/T5CA-57JM].

[83] *See id.*

[84] *Police Can Identify Suspect's Eye Colour from DNA*, NEW SCIENTIST (Dec. 7, 2011), https://www.newscientist.com/article/mg21228424-500-police-can-identify-suspects-eye-colour-from-dna/ [https://perma.cc/ZZ6A-MQTL].

[85] Peter Aldhous, *Genetic Mugshot Recreates Face from Nothing but DNA*, NEW SCIENTIST (Mar. 20, 2014), https://www.newscientist.com/article/mg22129613-600-genetic-mugshot-recreates-faces-from-nothing-but-dna/ [https://perma.cc/33T2-6LJM].

[86] Valerie Ross, *Forget Fingerprints: Law Enforcement DNA Databases Poised to Expand*, PBS (Jan. 2, 2014), https://www.pbs.org/wgbh/nova/next/body/dna-databases [https://perma.cc/S2ZL-RZ22].

[87] Concar, *supra* note 82.

[88] Bouslimani et al., *supra* note 12, at E7648–50.

[89] *Id.*

[90] *Id.* at E7652.

[91] *Id.* at E7646–47.

[92] *Id.* The type of information learned included the presence of sunscreen, DEET, certain foods, medicine, hair regrowth products, soap, cleaning products, and eye drops. *Id.* at E7650.

[93] *Id.* at E7650–51.

Such information could be helpful to investigators trying to identify an unknown suspect as information about lifestyle, habits, and medication can "narrow[ ] the pool of individuals to whom an object may have belonged."[94] However, such information also can be used more nefariously to predict future behavior, learn about the personal life of a known individual, discover private medical information, and use that information against the individual.[95]

C. The Advancement of Touch DNA and Chemical Interpretation of Skin Traces Significantly Alters the Legal Landscape

This development poses more than just a typical advancement in science. This advancement undermines the bedrock of the jurisprudential justification for allowing the collection of DNA samples from suspects. As discussed in Part III, *infra*, courts have allowed this collection because the DNA collected was so-called junk DNA and, therefore, the intrusiveness of the collection was outweighed by the government interest in solving cases. For example, the First Circuit upheld the requirement that those convicted of certain crimes must provide a sample of DNA for CODIS because the sample produced only a "kind of genetic fingerprint, which uniquely identifies an individual, but does not provide a basis for determining or inferring anything else about the person."[96] Moreover, the court agreed that if junk DNA was shown to be more useful than it currently is, it would reconsider its conclusion.[97] "[T]he discovery of new uses for 'junk DNA,' would require a reevaluation of the reasonableness balance."[98] That day has arrived.

That day has come in two possible ways. First, there is a significant challenge to the presumption that so-called junk DNA has no information other than identification. Some argue that it is misleading to label these loci "junk," as they are not devoid of information beyond that used for identification.[99] Some of the loci that were once thought to be junk are now understood to be medically meaningful, as science has evolved.[100] On the other hand, some scholars have noted that this is not entirely clear.[101] Regardless of whether the technology today can learn more than identifying information from these loci, "[f]uture technological advances in DNA testing . . . may

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[94] *Id.* at E7645.

[95] *See id.* at E7645–46.

[96] United States v. Weikert*,* 504 F.3d 1, 4 (1st Cir. 2007) (quoting H.R. REP. NO. 106-900(I), at 27 (2000)).

[97] *Id.* at 14–15.

[98] *Id.* at 14.

[99] *See, e.g.*, Cole, *supra* note 29, at 59.

[100] Joh, *supra* note 47, at 870.

[101] *See, e.g.*, D.H. Kaye, *Please, Let's Bury the Junk: The CODIS Loci and the Revelation of Private Information*, 102 NW. U. L. REV. COLLOQUY 70, 70 (2007) ("There is no scientific evidence that the specific DNA variations used to identify the sources of crime-scene DNA perform any biological functions.").

empower the government to conduct wide-ranging 'DNA dragnets' that raise justifiable citations to George Orwell."[102]

Secondly, the chemical interpretation of these epithelial cells can reveal the "personal lifestyle" of the source person.[103] While it is not the exact same technology of these specific loci, it is the chemical interpretation, on the molecular level, of only a few epithelial cells.[104] As such, this produces the same type of information that concerned all the circuits that analyzed DNA collection.

III. THE CURRENT FOURTH AMENDMENT JURISPRUDENCE DOES NOT PROTECT INDIVIDUAL PRIVACY RIGHTS IMPLICATED BY TOUCH DNA AND RELATED TECHNOLOGIES

Given the personal nature of the information available through touch DNA and chemical analysis, the privacy implications are immense. The Fourth Amendment would seem to be an obvious source of protection from the government obtaining this information without regulation.[105] However, under the current state of the law, that seems not to be the case.[106] Like many areas of rapidly moving technological and scientific advances, the Fourth Amendment's protection against unreasonable searches and seizures has failed to adapt. As such, under the current state of the law, Fourth Amendment jurisprudence provides inadequate protection.

In order for the Fourth Amendment to be implicated, the government must engage in a search or seizure.[107] Only if this action is unreasonable can the government be found to be acting unconstitutionally. In this context, there are three possible governmental actions that could be considered a potentially unreasonable search or seizure: collecting the DNA sample, extracting and testing the DNA, and retaining the DNA information. Traditional DNA jurisprudence does not seem to offer protection at these stages for touch DNA and related technologies.

A. Collecting the DNA Sample

When police are seeking to match two profiles, they often have samples from two sources: the suspect and the crime scene.[108] Obtaining a biological sample from a suspect can either be done (1) voluntarily, (2) under the law via either a statute requiring it, court order, or warrant, or now (3) from cells left behind by the individual.

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[102] *Weikert*, 504 F.3d at 15 (quoting Johnson v. Quander, 440 F.3d 490, 499 (D.C. Cir. 2006)).

[103] Bouslimani et al., *supra* note 12, at E7645–46.

[104] *Id.*

[105] *See* U.S. CONST. amend. IV.

[106] Joh, *supra* note 47, at 862–63.

[107] *Id.* at 863.

[108] However, other scenarios exist, including linking a victim's DNA to the suspect's person or possessions. *See, e.g.*, *id.* at 861.

If done voluntarily, then no Fourth Amendment issue arises, as an individual can voluntarily waive his or her Fourth Amendment rights and consent to a search.[109] However, in cases in which the individual was compelled, the Supreme Court has applied the Fourth Amendment search and seizure doctrine as a government intrusion into one's physical body—the most basic example of a governmental search.[110] Compelled collection of urine or breath has also been held to be a search.[111] As discussed *infra,* the Supreme Court has also upheld statutes mandating DNA collection from arrestees, asserting that the government interest in learning the actual identification of the arrestee outweighs the intrusion placed on the suspect by a brief swabbing of the cheek.[112]

Maryland v. King[113] is a significant decision in this area of the law.[114] Unlike some earlier technology cases, the Court was not unaware of the actual capabilities of DNA evidence.[115] Rather, by 2013, the power of DNA evidence was well known to the Court.[116] Some have critiqued the *King* Court for ignoring its knowledge of the potential for DNA technologies.[117] In cases involving equally rapid advances in technology, the Court has wrestled with the privacy implications of an expansive and, in some ways, ubiquitous technology.[118]

In *King*, the Court stood in a similar position and faced a choice. It could have recognized the power of DNA analysis and treated the collection of DNA as more invasive than that of other information about an individual, such as collection of an

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[109] *E.g.*, Schneckloth v. Bustamonte, 412 U.S. 218, 235 (1973) (noting that "consent" is a "waiver" of Fourth Amendment protection).

[110] Maryland v. King, 133 S. Ct. 1958, 1968–69 (2013) (forced sampling of arrestees is a search, but reasonable); Schmerber v. California, 384 U.S. 757, 767 (1966) (compulsory blood test implicates the Fourth Amendment). For a discussion regarding obtaining a biological sample from a third party after a suspect has voluntarily provided a sample for, for example, medical treatment, see Imwinkelried & Kaye, *supra* note 15, at 430–33. See *infra* Part V for a discussion of Fourth Amendment jurisprudence.

[111] Skinner v. Ry. Labor Execs.' Ass'n, 489 U.S. 602 (1989). Although a search, the Court considered the collection of such samples in certain circumstances under its "special needs" doctrine analysis, which allows such collection, when reasonable, if the government has a special need beyond criminal prosecution. *Id.* at 619.

[112] *See King*, 133 S. Ct. at 1968, 1970.

[113] 133 S. Ct. 1958 (2013).

[114] *See id.* at 1968 (stating that the case implicates an "expanding technology already in widespread use throughout the Nation").

[115] *See id.* at 1966 ("[T]he utility of DNA identification in the criminal justice system is already undisputed.").

[116] *See id.*

[117] *See, e.g.*, Tracey Maclin, *Government Analysis of Shed DNA Is a Search Under the Fourth Amendment*, 48 TEX. TECH. L. REV. 287, 304, 306 (2015).

[118] Riley v. California, 134 S. Ct. 2473, 2489 (2014) (recognizing the vast capacity of a smart phone to contain personal data and distinguishing its search from that of other objects found on an arrestee's person); United States v. Jones, 565 U.S. 400, 427 (2012) (Alito, J., concurring in the judgment).

arrestee's clothing, fingerprints, and photographs. Conversely, it could have treated the DNA collection like any other collection of information from an arrestee. The Court chose the latter, upholding the Maryland law that compels the collection of DNA from all arrestees of certain offenses.[119] In so doing, the Court unabashedly treated DNA as a very accurate form of fingerprinting and allowed its collection as a form of identification.[120]

This framing was met with vigorous opposition by Justice Scalia, writing in dissent.[121] He pointed out the weakness of this position given that the law at issue did not itself allow for analysis of the DNA sample until after the suspect was arraigned, thus belying the notion that the DNA was collected to ensure the valid identification of an arrestee.[122] Moreover, Justice Scalia noted that in *King*, as in many other cases, the DNA was uploaded to CODIS many months later to determine whether this suspect matched the DNA obtained in open cases.[123] Scalia characterized this as investigating open crimes, not simply identifying individuals.[124] Despite these points, the majority opinion in *King* seems to undermine the argument that compelled collection of DNA under certain broad regulations is an unreasonable search or seizure.[125]

The results are similar when the evidence is recovered from a discarded object.[126] This has been labeled shed DNA, but courts have treated it as abandoned DNA. In so doing, courts have concluded no search occurs when shed DNA is collected.[127]

A search is a government examination of an area where there is a reasonable expectation of privacy.[128] More recently, the Supreme Court clarified its definition of a search to still include the traditional definition of a governmental trespass into a constitutionally protected area, if the government intent is to obtain information.[129] Regardless of the definition, the law has consistently considered shed DNA as abandoned property.[130] There is no reasonable expectation of privacy in abandoned property.[131] Furthermore, there is no invasion of the body or detention of the individual to obtain the sample. Because an individual leaves this DNA on objects, it is

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[119] *See King*, 133 S. Ct. at 1965–66.
[120] *See id.* at 1972, 1976–77, 1980.
[121] *Id.* at 1980 (Scalia, J., dissenting).
[122] *Id.* at 1983.
[123] *Id.* at 1984.
[124] *Id.* at 1982–83.
[125] *See id.* at 1980 (majority opinion).
[126] Joh, *supra* note 47, at 865.
[127] *See* Maclin, *supra* note 117, at 289 & n.12, 290 (outlining the "nearly unanimous" cases rejecting Fourth Amendment challenges to such collections).
[128] Katz v. United States, 389 U.S. 347, 360–61 (1967) (Harlan, J., concurring).
[129] *See* Florida v. Jardines, 133 S. Ct. 1409, 1414 (2013); United States v. Jones, 565 U.S. 400, 404 (2012).
[130] Maclin, *supra* note 117, at 289 n.12.
[131] California v. Greenwood, 486 U.S. 35, 40–41 (1988).

arguably abandoned, and the courts treat the government's collection of it as not a search for purposes of the Fourth Amendment.[132] As such, there is neither an unreasonable Fourth Amendment search nor a seizure when the government collects abandoned property.[133]

This idea that shed DNA is abandoned property is not without controversy. Many scholars have challenged this notion.[134] Professors Edward J. Imwinkelried and D.H. Kaye argue that shed DNA is outside the abandonment doctrine because there is little to no intent to abandon one's DNA.[135] It is, in fact, impossible to prevent and, therefore, should not be treated as consciously abandoned.[136] Professor Tracey Maclin offers an equally strong critique.[137]

Although controversial, it could be argued that this approach made some doctrinal sense when the belief was that the shed DNA would reveal only the identity of its source. If a suspect chose to discard a cigarette remnant on the street, it would seem consistent with *California v. Greenwood*[138] that police collection of that object would raise no Fourth Amendment concerns.[139] In addition to constitutionally protected areas such as the home, the Fourth Amendment protects situations where a reasonable expectation of privacy is demonstrated.[140] No invasion of the body, detention of the person, or government intrusion into a constitutionally protected area occurs when police collect such an object. In fact, the very act of discarding that object is an objective manifestation that the suspect has no expectation of privacy in it.[141] Indeed, in light of the public's contemporary knowledge of DNA and its use in criminal investigations, one could argue that the individual, knowing the item contains biological data and discarding it anyway, most clearly retains no subjective or objective privacy interest in the object. This framework is compelling when the reasonableness of the seizure is justified simply because it only reveals information regarding the identity of a perpetrator of a crime. The invasion seems minimal in the collection of the object and in the information obtained. Indeed, it is hard to imagine that a defendant could successfully argue that the government's extraction of fingerprints from a discarded firearm once held by the suspect

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[132] *E.g.*, People v. Gallego, 117 Cal. Rptr. 3d 907, 911 (Cal. Ct. App. 2010) (discarded cigarette remnant); Williamson v. State, 993 A.2d 626, 634–35 (Md. 2010) (abandoned coffee cup).

[133] Pike, *supra* note 67, at 2014.

[134] *E.g.*, Maclin, *supra* note 117, at 307–11; Imwinkelried & Kaye, *supra* note 15, at 437–38.

[135] Imwinkelried & Kaye, *supra* note 15, at 436–40.

[136] *Id.* at 437–38 ("The deposition of DNA in public places cannot be avoided unless one is a hermit or is fanatical in using extraordinary containment measures."); Maclin, *supra* note 117, at 307–11.

[137] Maclin, *supra* note 117, at 311–12.

[138] 486 U.S. 35 (1988).

[139] *See id.* at 40–41.

[140] *See* Florida v. Jardines, 133 S. Ct. 1409, 1414 (2013).

[141] *Greenwood*, 486 U.S. at 40–41.

is a search, when all it will determine is the true identity of an individual and nothing more.

This analysis, however, loses some of its strength when one considers the power of the information discarded and the lack of volition of the individual. That cigarette remnant can reveal not only the identity of the individual; now, through chemical skin analysis and touch DNA, it can reveal so much more. It can reveal his health, drug use, medical condition, risk for disease, etc.[142] By examining traces of secreted medication it can reveal an individual's psychological health as well.[143] Indeed, chemical analysis can reveal information about the individual's lifestyle and demonstrate information about his or her activities.[144] These are some of the most personal of matters where one would seem to most certainly have an expectation of privacy. Therefore, the basis for not considering the collection of such evidence a search is eroded by the recognition of the amount of information available on the discarded item.

In addition to privacy expectations, this legal framework is more suspect when one considers the lack of volition in the discarded DNA or trace cells themselves. It is one thing to abandon an object and have the government obtain that object and examine it for information. It seems quite another to simply exist—move through life by walking, sitting, speaking on a telephone, holding a pen—and have the trail of abandoned DNA collected. Not only does this scenario alone have a lack of any volition, but it is impossible to prevent the shedding of these cells. With the advent of highly sensitive touch DNA and related technologies, it is actually impossible to prevent the leaving of seven or eight cells imperceptible to the eye.[145] Yet, these technologies transform these cells into gateways to personal information. If the government can have unfettered access to this information, the Fourth Amendment becomes a tiger with absolutely no teeth and individuals risk being stripped of any sense of protection.

B. DNA Extraction and Testing

Another potential point in the process where the Fourth Amendment could offer some protection is when the samples are extracted and tested. However, under the current state of the law, this seems to have gained little broad traction.[146] The Fourth Circuit Court of Appeals has recognized that whether a person has a reasonable expectation of privacy in his DNA is a "developing and unsettled area of the

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[142] *See* Bouslimani et al., *supra* note 12, at E7645.

[143] *See id.* at E7648.

[144] *See id.* at E7645.

[145] *See* Imwinkelried & Kaye, *supra* note 15, at 436–38.

[146] *Contra* Mario W. v. Kaipio, 281 P.3d 476, 482–83 (Ariz. 2012) (finding that seizure of DNA sample of juvenile arrestee was authorized, but that the creation of a DNA profile implicated privacy interests).

law."[147] Acknowledging this ambiguity, however, the Fourth Circuit went on to hold that the extraction of DNA from lawfully collected evidence when the defendant is the target of an investigation is a search under the Fourth Amendment, and that it is an unreasonable search when done without a warrant.[148] However, several other courts have rejected the Fourth Circuit's analysis.[149] Many have based their analysis on *United States v. Dionisio*,[150] which held the required disclosure of a suspect's voice is not a Fourth Amendment violation because obtaining a voice exemplar did not involve probing into one's personal life.[151] Although the Court in *Skinner v. Railway Labor Executives' Ass'n*[152] acknowledged that the chemical analysis of urine can reveal a host of private information and is a search, it also concluded that such a search was reasonable.[153]

Although in the context of hardware, courts have accepted, to some degree, the idea that two Fourth Amendment events take place—the seizure of the computer and the later examination of it[154]—the same cannot be said of analysis of bodily fluids.[155] In *Schmerber v. California*,[156] for example, the Court's analysis focused on the seizure of the blood sample, and not on the subsequent testing of the blood for alcohol.[157] Professors Kaye and Imwinkelried describe the state of the law as without restraint once a sample is collected lawfully.[158]

That being said, many of the courts that have decided that the extraction and testing of a DNA sample is not an unreasonable search have based their decision on the lack of a reasonable expectation of privacy in one's identity.[159] Just as one has no expectation of privacy in a fingerprint or physical characteristic, one also lacks an expectation in the physical characteristic of one's DNA, as it only discloses the physical characteristic of identity.[160]

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[147] United States v. Davis, 690 F.3d 226, 240 (4th Cir. 2012).

[148] *Id.* at 242–50.

[149] Schmidt v. Stassi, 250 F. Supp. 3d 99, 106–07 (E.D. La. 2017) (noting that other courts disagree with *Davis*); United States v. Hinton, 113 F. Supp. 3d 1277, 1290 (N.D. Ga. 2015); Commonwealth v. Arzola, 26 N.E.3d 185, 193–94 (Mass. 2015).

[150] 410 U.S. 1 (1973).

[151] *Id.* at 15.

[152] 489 U.S. 602 (1989).

[153] *Id.* at 632–34.

[154] COMPUT. CRIME & INTELLECTUAL PROP. SECTION, CRIMINAL DIV., U.S. DEP'T OF JUSTICE, SEARCHING AND SEIZING COMPUTERS AND OBTAINING ELECTRONIC EVIDENCE IN CRIMINAL INVESTIGATIONS 86 (3d ed. 2009), https://www.justice.gov/sites/default/files/criminal-ccips/legacy/2015/01/14/ssmanual2009.pdf [https://perma.cc/SF49-2478].

[155] *See* Schmerber v. California, 384 U.S. 757, 768 (1966).

[156] 384 U.S. 757 (1966).

[157] *Id.* at 768.

[158] Imwinkelried & Kaye, *supra* note 15, at 418.

[159] *See, e.g.*, Raynor v. State, 99 A.3d 753, 764 & n.9 (Md. 2014).

[160] *E.g.*, *id.* at 764 n.9 ("[N]o individual has a reasonable expectation of privacy in his or

Because these technologies will expose far more than identity, testing may be the point where privacy protections are implicated. The reason for many of these rejections of *Davis* is rooted in the belief that no reasonable expectation of privacy exists in the identification loci.[161] However, touch DNA and related technologies offer the opportunity to collect a few cells from an object and probe deeply into one's health and personal life. As such, although the Fourth Circuit in *Davis* is in the minority, when applied to these new technologies, the existence of a Fourth Amendment event is more apparent, and the law should reflect that distinction.

C. Retaining the DNA Information

Continuing along that line, some scholars have suggested that once the government has obtained biological evidence for a lawful purpose, the law allows its use for any purpose.[162] This has implications both for the testing of the sample, as well as the next possible Fourth Amendment event—the preservation of the sample, in either a database or storage, for some potential future use. Here, again, the current state of the law, although not uniform, suggests little constitutional protection. In *United States v. Kriesel*,[163] the Ninth Circuit rejected the defendant's argument that it was unreasonable for the government to retain his DNA after he completed probation.[164] In so doing, the court found it reasonable because of the importance of the efficiency of CODIS.[165] In contrast, the Fourth Circuit found that a crime victim retains a privacy interest in his DNA collected at a crime scene, but that the admissibility of evidence against the victim, now turned defendant, was not unreasonable.[166] Most courts that have ruled upon the issue have found that the retention and later matching of a lawfully obtained DNA profile is not a search.[167]

The First Circuit reserved for another day the question of whether it is constitutional to retain a DNA profile of a defendant after he is no longer under supervised release, finding this issue is far from resolved.[168] In *United States v. Weikert*,[169] the First Circuit noted such an ambiguous approach was due to the "rapid pace of

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her identifying physical characteristics."); *see also* Commonwealth v. Smith, 164 A.3d 1255 (Pa. Super. Ct. 2017).

[161] *See Raynor*, 99 A.3d at 761.

[162] Imwinkelried & Kaye, *supra* note 15, at 418.

[163] 720 F.3d 1137 (9th Cir. 2013).

[164] *Id.* at 1146–47.

[165] *Id.*

[166] United States v. Davis, 690 F.3d 226, 256 (4th Cir. 2012).

[167] *E.g.*, Boroian v. Mueller, 616 F.3d 60, 67–68 (1st Cir. 2010); Wilson v. Collins, 517 F.3d 421, 428 (6th Cir. 2008); United States v. Hinton, 113 F. Supp. 3d 1277, 1290 (N.D. Ga. 2015); Raynor v. State, 99 A.3d 753, 767–68 (Md. 2014).

[168] *See* United States v. Weikert, 504 F.3d 1, 3 (1st Cir. 2007).

[169] 504 F.3d 1 (1st Cir. 2007).

technological development in the area of DNA analysis."[170] Given the emergence of touch DNA and related chemical analysis, this recognition appears well-advised.

That is not to say there are no protections. Many state laws that authorize the collection of samples from arrestees or convicted felons limit their storage.[171] For example, the Maryland statute at issue in *King* specifically allowed the collection of the evidence at arrest, but limited the testing and retention of it.[172]

However, given the substantial privacy implications of touch DNA and related technologies, this reliance on state law is insufficient.[173] First, this does nothing with regard to evidence obtained at a crime scene. Arguably, nor should it. It is essential in crime investigation to preserve and analyze evidence, and no regulation limiting this activity seems advisable. Such recovered evidence has led to the conviction of violent criminals as well as the exoneration of wrongly accused persons.[174] Samples initially retrieved and found unhelpful have been able to resolve cases after the development of more sensitive testing.[175] Such advances have exonerated hundreds of wrongly convicted people.[176] That being said, however, the advent of touch DNA and related technologies implicates much more than obtaining information regarding the identity of a person at a crime scene. It also means learning about their personal lives and creating a personal profile for every person at that location, whether involved in a crime or not.

Secondly, some of the advocates of this technology envision the creation of massive databases of individuals, as well as the creation of personal profiles of individuals, based on the chemicals found in their epithelial cells on the molecular level.[177] These researchers seem to envision large-scale data collection, and some

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[170] *Id.* at 3.

[171] *See* GIANNELLI ET AL., *supra* note 17, § 18.05[a][2].

[172] MD. CODE ANN., PUB. SAFETY § 2-504(a) (West 2011); Maryland v. King, 133 S. Ct. 1958, 1967 (2013). Civil lawsuits have challenged the consensual storage of genetic data. *See* Bearder v. State, 806 N.W.2d 766, 776 (Minn. 2011); Pike, *supra* note 67, at 1985–87 (referring to a similar Texas lawsuit, Complaint at 4–5, Beleno v. Tex. Dep't of State Health Servs., No. SA-09-CA-0188-FB (W.D. Tex. Mar. 12, 2009)).

[173] *See* Pike, *supra* note 67, at 1979 (citing Albert E. Scherr, *Genetic Privacy & the Fourth Amendment: Unregulated Surreptitious DNA Harvesting*, 47 GA. L. REV. 445, 484 (2013)).

[174] *See generally* Jennie Vee Silk, *Calling Out* Maryland v. King*: DNA, Cell Phones, and the Fourth Amendment*, 51 CRIM. L. BULL. 1212 (2015) (manuscript available at https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2553606).

[175] *See generally* SAMUEL R. GROSS & MICHAEL SHAFFER, EXONERATIONS IN THE UNITED STATES, 1989–2012: REPORT BY THE NATIONAL REGISTRY OF EXONERATIONS (2012), https://www.law.umich.edu/special/exoneration/Documents/exonerations_us_1989_2012_full_report.pdf [https://perma.cc/U5FP-M27Q].

[176] *Id.* at 8.

[177] *See* Bouslimani et al., *supra* note 12, at E7652; *see also id.* at E7651 ("One can imagine . . . in the future to have a statistical approach and a confidence score for the type of lifestyle when appropriate databases become available that connect each molecule and associate such signatures with a lifestyle . . . .").

argue this is already occurring.[178] Some scholars have advocated for a universal DNA database.[179] This seems akin to the Big Data currently collected on individuals regarding their digital activity.[180] Much debate has occurred regarding the propriety of this collection as well as the government's ability to participate within appropriate boundaries.[181] Although *King* recognized this issue, it dismissed it, finding the statute at issue in the case prohibited misuse of retained DNA samples.[182]

While the Court has not directly addressed the retention of records about individuals, Justice Sotomayor raised significant concerns about it in *Jones*.[183] Writing for only herself in concurrence, she sounded the alarm about not only the surveillance of individuals through GPS monitoring, but the retention and sharing of that information by the government without regulation.[184] She noted that "the government's unrestrained power to assemble data that reveal private aspects of identity is susceptible to abuse. . . . [M]aking available at a relatively low cost such a substantial quantum of intimate information about any person whom the government, in its unfettered discretion, chooses to track [ ] may 'alter the relationship between citizen and government in a way that is inimical to democratic society.'"[185] In what has been widely regarded as the first endorsement of the mosaic theory by a Supreme Court Justice,[186] this concurrence raises important issues and perhaps will push the Court in the direction of addressing the increasing problem of the governmental and corporate ability to collect and retain small pieces of data about individuals and use this data to gain deeply personal information about the individuals. While the Court moved closer to understanding the power of collecting several distinct pieces of information about an individual and utilizing them to reconstruct one's life in *Riley*, as of now, the day of fully addressing that power has not been realized.[187]

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[178] *E.g.*, Pike, *supra* note 67, at 1982 (citing a 1999 RAND Corporation report asserting that over 307 million tissue samples from over 178 million people have been collected).

[179] *See* Arnold H. Loewy, *A Proposal for the Universal Collection of DNA*, 48 TEX. TECH L. REV. 261, 261–62 (2015). For a discussion of the debate surrounding the creation of a national database, see GIANNELLI ET AL., *supra* note 17, § 18.05[a][2], at 135 n.408.

[180] *See* Mary Graw Leary, Katz *on a Hot Tin Roof—Saving the Fourth Amendment from Commercial Conditioning by Reviving Voluntariness in Disclosures to Third Parties*, 50 AM. CRIM. L. REV. 341 (2013).

[181] *See, e.g.*, *id.*; Mary G. Leary, *The Missed Opportunity of* United States v. Jones*: Commercial Erosion of Fourth Amendment Protection in a Post–Google Earth World*, 15 U. PA. J. CONST. L. 331 (2012); Pike, *supra* note 67, at 1983–84.

[182] Maryland v. King, 133 S. Ct. 1958, 1967 (2013); *see also* MD. CODE ANN., PUB. SAFETY § 2-505(b) (West 2011).

[183] United States v. Jones, 565 U.S. 400, 416–18 (2012) (Sotomayor, J., concurring).

[184] *Id.*

[185] *Id.* at 416 (quoting United States v. Cuevas-Perez, 640 F.3d 272, 285 (7th Cir. 2011) (Flaum, J., concurring)).

[186] *See* Orin S. Kerr, *The Mosaic Theory of the Fourth Amendment*, 111 MICH. L. REV. 311, 313 (2012).

[187] *See* Riley v. California, 134 S. Ct. 2473, 2489 (2014). At the time of publication, the Court has granted certiorari in *Carpenter v. United States*, which challenges the warrantless

IV. THIS INCREASED USE OF TOUCH DNA AND RELATED TECHNOLOGIES RAISES ADDITIONAL CONCERNS FOR BOTH SUSPECTS AND VICTIMS OF CRIME

As with nearly all investigative tools that implicate the Fourth Amendment, a tension exists. This is the inherent Fourth Amendment struggle between an individual's right to privacy and society's need for security.[188] For most of the technological advances addressed by the Court—recording conversations, thermo-imaging, beepers, dog sniffing, GPS tracking, etc.—the investigatory technique at issue served a legitimate government interest.[189] Phrased another way, these advances often represent powerful tools law enforcement can utilize to combat increasingly sophisticated criminal and now terrorist elements. However, as these techniques become more advanced, they become more intrusive, and references to George Orwell, once thought to be hyperbolic, become more apt.

It is here that touch DNA and chemical interpretation of skin cells reside. The ability to determine from any object at a crime scene clues about who was present during a crime could transform criminal investigation. This is especially true in homicides, terrorist attacks, or stranger sexual assaults, where the trail often goes cold without witnesses able to identify perpetrators. With a "clearance rate" for homicides at 64%, one in three homicides goes unsolved.[190] This technology could revive many cold cases by providing clues about the lifestyle of the unknown perpetrators. Such information could ultimately lead to a focus on a guilty criminal who would otherwise escape punishment.

However, the power to learn personal and intimate details about the source of the touch evidence is immense. *King* sidestepped this concern by asserting that all DNA testing was examining junk DNA; it recognized more sensitive information could be obtained, but concluded that state statutes could adequately limit such a use.[191] This narrow approach was vociferously rejected by Justice Scalia in dissent, as well as by many scholars.[192] This, combined with a threat that the government

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collection of geolocation information through cell phones. United States v. Carpenter, 819 F.3d 880 (6th Cir. 2016), *cert. granted*, 137 S. Ct. 2211 (2017) (No. 16-402). This case could implicate the mosaic theory and indicate whether the theory will be endorsed by the Court.

[188] *See* Leary, *supra* note 181, at 362.

[189] *See, e.g.*, *Jones*, 565 U.S. at 402–05.

[190] Martin Kaste, *Open Cases: Why One-Third of Murders in America Go Unresolved*, NPR (Mar. 30, 2015, 5:04 AM), https://www.npr.org/2015/03/30/395069137/open-cases-why-one-third-of-murders-in-america-go-unresolved; *see also* Thomas Hargrove, *How Many Unsolved Murders Are There? It's Greater than the Population of Des Moines*, DENVER CHANNEL (Jan. 16, 2015, 10:25 AM), https://www.the denverchannel.com/decodedc/how-many-unsolved-murders-are-there-its-greater-than-the-population-of-des-moines [https://perma.cc/B34S-2C42] (noting that more than 211,000 homicides remain unsolved).

[191] Maryland v. King, 133 S. Ct. 1958, 1979–80 (2013).

[192] Silk, *supra* note 174 (manuscript at 4–5, 9–11).

could collect such information and retain it indefinitely, raises even more privacy concerns. This technology poses specific additional risks for suspects and crime victims which must be addressed.

A. Concern for Potential Suspects: Reliability

This technology, while powerful, is not without risk. The technology of touch DNA is so sensitive that it can include cells transferred from innocent people to crime scenes.[193] Such an event could lead to a false conviction. DNA is regarded as particularly reliable,[194] and is the predominate method to overturn convictions.[195] If a suspect is wrongly convicted through touch DNA, correcting such a wrong and proving his or her innocence may be an insurmountable task.

Research suggests the transfer of epithelial cells between people is a significant concern. In one study, researchers had pairs of people shake hands for two minutes and then later handle knives.[196] In 85% of the cases, DNA was transferred from the other person to the knife, and in 20% of the cases that DNA was identified as the main or only DNA contributor.[197] Thus, the sensitivity of this technology is a double-edged sword. On the one hand, it opens new investigative doors. On the other, its success is determined by the amount of cells present, which varies from one person to another and from one circumstance to another.

In addition to transfer from people legitimately present at a crime scene, contamination of evidence is also a greater problem with the increased sensitivity of these investigative tools. Contamination of such evidence "is the unintentional introduction of outside DNA into a crime scene or laboratory sample."[198] When this occurs, the contaminating DNA can appear as background DNA, or as the single or a major source in a mixture of DNA.[199] Because CODIS contains DNA samples of unknown origin from crime scenes, this could include DNA from innocent individuals who were at crime scenes before the crime.[200]

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[193] Michelle Malkin, *Forensic Nightmare: The Perils of Touch DNA*, NAT'L REV. (Jan. 4, 2017, 12:00 AM), https://www.nationalreview.com/article/443500/touch-dna-evidence-can-lead-convictions-innocent-people [https://perma.cc/6Y2T-GUZS].

[194] *Id.* However, questions have been raised about subjective analysis of mixed samples. *See* PRESIDENT'S COUNCIL OF ADVISORS ON SCI. & TECH., EXEC. OFFICE OF THE PRESIDENT, FORENSIC SCIENCE IN CRIMINAL COURTS: ENSURING SCIENTIFIC VALIDITY OF FEATURE-COMPARISON METHODS 75–83 (2016).

[195] *See* GROSS & SHAFFER, *supra* note 175, at 8.

[196] Cynthia M. Cale, *Forensic DNA Evidence Is Not Infallible*, 526 NATURE 611 (2015).

[197] *Id.*

[198] Minor, *supra* note 13.

[199] *Id.*

[200] Adrienne N. Kitchen, *Genetic Privacy and Latent Crime Scene DNA of Nonsuspects: How the Law Can Protect an Individual's Right to Genetic Privacy While Respecting the Government's Important Interest in Combatting Crime*, 52 CRIM. L. BULL. 371, 374, 381 (2016).

With increased sensitivity, more DNA can be located at crime scenes and more of it can be from innocent sources.[201] For example, a case of transfer through an EMT's use of an oxygen monitor on two patients implicated the first patient in the killing of the second patient, whom he had never met.[202] Scientists have expressed concern that heightened sensitivity of touch DNA can create false positives when they identify the DNA of another.[203]

Courts have been somewhat ambiguous on the question of whether touch DNA is generally accepted by the scientific community.[204] While most have implied its acceptance,[205] some courts and statutes treat it differently than traditional DNA when considering motions by defendants for retesting after conviction.[206]

Similar concerns about reliability exist with chemical analysis of theses molecular samples. Researchers found that some distinct chemicals were present in the cells four months after their use.[207] These included evidence of the use of certain medications, dietary items, and hygiene products.[208] While not inaccurate, such findings could be misleading. For example, the presence of a certain medication and self-tanning products may point law enforcement in the direction of a person with a certain skin tone who recently received a particular medication. However, if both of those data points are outdated, police investigation may lead to the incorrect person, although corroborated by physical evidence.

While this evidence can be a powerful law enforcement and exoneration tool, its reliability is not that of traditional DNA. As such, it is proper to consider this

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[201] *See* Barbara Prainsack, *Key Issues in DNA Profiling and Databasing: Implications for Governance*, *in* GENETIC SUSPECTS: GLOBAL GOVERNANCE OF FORENSIC DNA PROFILING AND DATABASING 15, 19 tbl.2.1 (Richard Hindmarsh & Barbara Prainsack eds., 2010).

[202] Malkin, *supra* note 193.

[203] Douglas Starr, *Forensics Gone Wrong: When DNA Snares the Innocent*, SCIENCE (Mar. 7, 2016, 10:00 AM), https://www.sciencemag.org/news/2016/03/forensics-gone-wrong-when-dna-snares-innocent [http://perma.cc/4EN5-V28B]. At the same time, some exoneration groups routinely seek touch DNA as a method of exonerations. *Id.*

[204] *E.g.*, State v. Nevius, No. 04-10-0985, 2012 WL 2361516, at *20 (N.J. Super. Ct. App. Div. June 18, 2012) (noting no evidence that touch DNA is generally accepted); State v. Carver, 725 S.E.2d 902, 908 (N.C. Ct. App. 2012) (Hunter, J., dissenting) (emphasizing that the evidence available was touch DNA and questioning the majority's reliance on it, given the "relatively new" testing for it).

[205] *See, e.g.*, United States v. McCluskey, 954 F. Supp. 2d 1224, 1241–43 (D.N.M. 2013) (allowing PCR/STR method of DNA analysis and calling it "generally reliable"); Bean v. State, 373 P.3d 372, 380 (Wyo. 2016) (parties stipulated to use touch DNA evidence); People v. Lopez, No. B251815, 2015 WL 687294, at *5 (Cal. Ct. App. filed Feb. 18, 2015) (forensic statistical tool accepted); Swearingen v. State, 303 S.W.3d 728, 733 (Tex. Crim. App. 2010), *cert. denied*, 565 U.S. 1241 (2012) (defendant's motion for post-conviction DNA testing denied).

[206] *See* KY. REV. STAT. ANN. § 422.285(5)(e), (6)(e) (West 2017); Owens v. Commonwealth, 512 S.W.3d 1, 9–10 (Ky. Ct. App. 2017).

[207] Bouslimani et al., *supra* note 12, at E7647.

[208] *Id.*

when weighing Fourth Amendment concerns. The government interest in the evidence to be obtained is weighed against the intrusion into the person's privacy. If the evidence is less reliable, then the government interest is weaker, and a subsequent intrusion without a warrant is less reasonable.

B. Concerns Also Exist for Crime Victims

A world in which law enforcement or even criminal defendants can utilize touch DNA and related technologies poses possible invasions of privacy not only for suspects, but for witnesses and victims as well. In forensic analysis, the goal is not always to identify a suspect or connect him to the crime scene. Sometimes the source of crime scene evidence is unknown and could belong to a victim, witness, or perpetrator. Other times, the source is known to be that of the victim, and investigators seek to determine if it is present on the defendant or his belongings. For example, upon arrest, police may see blood spatter on a suspect's clothing and seek to have it tested to determine if it is that of the victim.

A victim may retain an expectation of privacy in her DNA even if her DNA material is lawfully in possession of the police. While the law is limited and ambiguous in the area, it is clear that a victim—whose status is not lessened as it is for an arrestee, prisoner, or parolee—has a stronger argument due to that undiminished status.[209] Furthermore, there is a question of procedure. When a victim's DNA is retained to determine if a suspect's possessions contain her DNA, the suspect cannot assert the expectation of privacy in the victim's DNA to prevent the testing.[210] Moreover, if the defense independently tests such evidence, no state actor is searching the DNA.

This scenario poses a threat to victims from both the government and others.[211] The government can invade the privacy of victims to justify a failure to pursue cases. Furthermore, as with all technologies, the use of touch DNA or cellular chemical analysis cannot be contained to law enforcement or to criminal law. Such information could be sought to discredit victims by obtaining information about them not usually available to defendants.

For example, this type of information may reveal medications which, in turn, could also indicate the presence of certain medical conditions not otherwise relevant or available to the parties. Such evidence contributes to improperly dismissing cases. Additionally, it could be utilized as a source of improper discovery to conjure up irrelevant information about witnesses and then utilize it against them, either during trial or pretrial to dissuade them from proceeding.

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[209] *See* United States v. Davis, 690 F.3d 226, 246 (4th Cir. 2012).

[210] *See, e.g.*, Jones v. United States, 362 U.S. 257, 261 (1960).

[211] *See Davis*, 690 F.3d at 229, 256 (police seized a shooting victim's clothing and years later extracted and tested DNA to create a profile for the victim as a suspect in another case).

Such use of evidence is not farfetched.[212] Nowhere is this more apparent than in sexual assault cases. These types of cases suffer a level of attrition unlike any other type of case due to many factors.[213] They are among the most under-reported forms of victimization, due, in large part, to the expected treatment of victims by law enforcement, the defendants, and the public airing of their cases.[214] A common defense in sexual assault cases is to attack the victim.[215] The consequences of this are felt not only in the actual experience of victims at trial, but also prior to trial, when the message the defense often communicates to victims is that their personal life will be unfairly displayed to the public; such a traumatic experience on the heels of a sexual assault causes an end to the prosecution.

The idea that irrelevant biological evidence will be used against survivors of sexual assault is not novel. Sexual assault kits collect potential evidence from victims' bodies for sexual assault prosecutions. Yet, some research suggests that police at times use sexual assault kit collection "to discourage rape reporting, investigation, and prosecution by using the forensic evidence collection process as a way to intimidate victims, diminish the seriousness of the assault, and attack victims' credibility as witnesses."[216] Similarly, it was recently discovered that tens of thousands of rape kits—kits in which victims subjected themselves to some of the most humiliating of procedures—were simply not tested.[217] The Department of Justice

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[212] The Supreme Court invalidated a program in which hospitals obtained urine screens from pregnant patients without their knowledge to determine if the mothers were using narcotics during pregnancy. Ferguson v. City of Charleston, 532 U.S. 67 (2001). They would then share the information with prosecutors, who utilized the results to criminally charge the mothers. *Id.* at 73–74. *See generally* Mary Graw Leary, *Affirmatively Replacing Rape Culture with Consent Culture*, 49 TEX. TECH. L. REV. 1 (2016).

[213] Rose Corrigan, *The New Trial By Ordeal: Rape Kits, Police Practices, and the Unintended Effects of Policy Innovation*, 38 LAW & SOC. INQUIRY 920, 923 (2013).

[214] Megan A. Alderden & Sarah E. Ullman, *Creating a More Complete and Current Picture: Examining Police and Prosecutor Decision-Making When Processing Sexual Assault Cases*, 18 VIOLENCE AGAINST WOMEN 525, 525 (2012) ("Research has found that the attrition rate continues to be high for sexual assault cases . . . ."); NAT'L SEXUAL VIOLENCE RES. CTR., STATISTICS ABOUT SEXUAL VIOLENCE (2015), http://www.nsvrc.org/sites/default/files/publications_nsvrc_factsheet_media-packet_statistics-about-sexual-violence_0.pdf [https://perma.cc/YD5H-WCN8]; *see also* CALLIE MARIE RENNISON, BUREAU OF JUSTICE STATISTICS, U.S. DEP'T OF JUSTICE, RAPE AND SEXUAL ASSAULT: REPORTING TO POLICE AND MEDICAL ATTENTION, 1992–2000, at 2 (2002), https://www.bjs.gov/content/pub/pdf/rsarp00.pdf [https://perma.cc/L3UB-C7MP] (indicating that over half of all sexual assaults go unreported).

[215] Alderden & Ullman, *supra* note 214, at 542.

[216] Corrigan, *supra* note 213, at 921.

[217] *See* NANCY RITTER, U.S. DEP'T OF JUSTICE, THE ROAD AHEAD: UNANALYZED EVIDENCE IN SEXUAL ASSAULT CASES 1, 4–5 (2011), https://www.ncjrs.gov/pdffiles1/nij/233279.pdf [https://perma.cc/2HRK-JS89] (acknowledging that there is no way to determine an exact number, but noting that the number of untested sexual assault kits—at least 10,000 in Los Angeles, 12,000 in Dallas, and 10,500 in Detroit—indicated the breadth of the problem).

found that police did not submit completed rape kits in 18% of sexual assault cases between 2002 and 2007.[218] Human Rights Watch found 12,000 unprocessed kits in Los Angeles.[219] Other jurisdictions fail to test 75% of adult rape kits.[220] These kits potentially contain evidence of sexual assailants.[221] The failure to test sexual assault kits is more than just an oversight. Sexual assault cases by nature rely on these kits to corroborate victims' testimony and identify perpetrators.[222] Yet, these kits were simply collected and shelved, notwithstanding the fact that the presence of a sexual assault kit is one of the determining factors for prosecutors' decision to prosecute cases.[223]

Even when collected, however, the kit and accompanying questions during the exam can reveal information irrelevant to the rape investigation, such as the use of birth control, presence of a sexually transmitted disease, or sexual history. This information is learned and, although irrelevant to the prosecution, has been used to decide not to pursue cases or to discredit victims.[224] For example, police have had victims' blood tested for drugs—without consent—to assess credibility.[225] In *Reedy v. Evanson*,[226] police did just that, charging the victim with falsely reporting a crime

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[218] *Id.* at 1.

[219] *Testing Justice: The Rape Kit Backlog in Los Angeles City and County*, HUM. RTS. WATCH (Mar. 31, 2009), https://www.hrw.org/report/2009/03/31/testing-justice/rape-kit-backlog-los-angeles-city-and-county [https://perma.cc/E4Z6-2B7K]; *accord* RITTER, *supra* note 217, at 1, 3. There may seem to be some reasons that a sexual assault kit might not be submitted for testing, such as a victim's announced unwillingness to proceed or a clear defense of consent. However, more often these are inadequate. Such kits can be building blocks in a case regardless of a victim's views on the heels of a traumatic assault. Knowing that her testimony is corroborated by physical evidence is important. Moreover, such kits can link a perpetrator to multiple assaults. *See* Ken Armstrong & T. Christian Miller, *An Unbelievable Story of Rape*, MARSHALL PROJECT (Mar. 12, 2009), https://www.themarshallproject.org/2015/12/16/an-unbelievable-story-of-rape [https://perma.cc/V9VA-7F2F].

[220] Corrigan, *supra* note 213, at 940.

[221] *See* RITTER, *supra* note 217, at 1. Of the 1,595 kits tested in Detroit, 28% "revealed the DNA identification of a potential suspect." *Sexual Assault Investigations: Untested Evidence in Sexual Assault Cases*, NAT'L INST. JUST., https://www.nij.gov/topics/law-enforcement/investigations/sexual-assault/pages/untested-sexual-assault.aspx [https://perma.cc/YDW4-U5MH] (last visited Dec. 4, 2017).

[222] *See* Corrigan, *supra* note 213, at 940 (citing Erin Murphy, *The New Forensics: Criminal Justice, False Certainty, and the Second Generation of Scientific Evidence*, 95 CALIF. L. REV. 721 (2007)). Research suggests that many marginalized people's sexual assault reports are disregarded. *Id.*

[223] Alderden & Ullman, *supra* note 214, at 533, 537–38.

[224] Corrigan, *supra* note 213, at 941 (citing Linda E. Ledray, *Forensic Medical Evidence: The Contributions of the Sexual Assault Nurse Examiner (SANE)*, *in* RAPE INVESTIGATION HANDBOOK 119 (John O. Savino & Brent E. Turvey eds., 2005)).

[225] *E.g.*, Reedy v. Evanson, 615 F.3d 197, 226–27 (3d Cir. 2010); Corrigan, *supra* note 213, at 940–41.

[226] 615 F.3d 197 (3d Cir. 2010).

only to drop charges when they learned she was raped by a serial rapist.[227] The arrest occurred even though "a reasonable jury could conclude that, at the time the arrest was made, the facts and circumstances within [the detective's] knowledge were not sufficient 'to warrant a prudent man in believing that [the suspect] had committed . . . an offense.'"[228]

Under traditional DNA analysis, some courts and state statutes allow a defendant who makes a sufficient showing to force a third party into testing.[229] If expanded to touch DNA, a defendant could order a victim to reveal highly personal information through a sample.

To be clear, relevant evidence concerning a victim's credibility should certainly be a part of a criminal trial and defendants have an absolute right to be confronted by their accusers. The concern regarding this evidence is in no way intended to suggest that sexual assault suspects should be treated differently from others. Rather, it merely recognizes the reality that this evidence will be misused to contribute to the attrition of sexual assault cases.[230] Consequently, as the use of touch DNA and related technologies increase, similar legal protections must be put in place to protect victims from improperly inflicting trauma at trials with irrelevant personal evidence now at the defense counsel's and police's disposal.

V. GET AHEAD OF TECHNOLOGY AND EXPAND *RILEY V. CALIFORNIA* FRAMEWORK TO OTHER TECHNOLOGIES

The law often necessarily follows technological advances, rather than precedes them. The Court has recognized the unwise temptation to intervene in burgeoning technological investigative techniques before their use is settled.[231] That being said, in a number of technology based cases heard by the Court in the last decade, the Court has offered some guidance.[232] This framework provides a workable approach to touch DNA and related technologies. Essential to this framework is avoiding creating a legal rule tied to technology. Such an approach will always fail because the

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[227] *Id.* at 202.

[228] *Id.* at 223 (second alteration in original) (quoting Wright v. City of Phila., 409 F.3d 595, 602 (3d Cir. 2005)).

[229] *See, e.g.*, *In re* Jansen, 826 N.E.2d 186, 192 (Mass. 2005).

[230] Heather Littleton et al., *Impaired and Incapacitated Rape Victims: Assault Characteristics and Post-Assault Experiences*, 24 VIOLENCE & VICTIMS 439, 444–45 (2009) (referring to use of a stigma scale to assess feelings of stigma following sexual assault).

[231] *See* Maryland v. King, 133 S. Ct. 1958, 1980–90 (2013) (Scalia, J., dissenting); City of Ontario v. Quon, 560 U.S. 746, 768–69 (2010) (Scalia, J., concurring in part and concurring in the judgment); *cf.* Kyllo v. United States, 533 U.S. 27, 34–36 (2001) (noting that it is proper for the Court to consider not only crude technology before it, but also more sophisticated technology in development).

[232] Riley v. California, 134 S. Ct. 2473 (2014); United States v. Jones, 565 U.S. 400 (2012); *Kyllo*, 533 U.S. 27.

technology will evolve before the ink is dry, thus making the rule obsolete.[233] Rather, the legal framework must be based on the type of information being sought. Because it is based on the purpose of information being sought or examined—not on the technology itself—it can guide investigations currently using these techniques. By creating this framework now, parties can avoid establishing a normative practice for law enforcement only to have the courts later find it unconstitutional, and thus disrupt commonly accepted approaches.

The solution requires separate Fourth Amendment standards for the collection and identification testing of the evidence and the more intrusive analysis of that evidence for information other than identity. This framework, based on the analytical framework of *Riley v. California*[234] is consistent with *United States v. Jones*,[235] *Kyllo v. United States*,[236] and *Maryland v. King*.[237] Prior to *Kyllo*, as the Court saw advances in technology, it generally did not expand Fourth Amendment rights.[238] However, more recently the Court has expanded Fourth Amendment protections.[239] The result has been characterized as inconsistent with the Court seemingly protecting privacy in *Riley* but failing to do so in *King*.[240] However, these cases can be somewhat reconciled by distinguishing between obtaining identity information and obtaining more intrusive information. It would leave the law regarding the reasonableness of collecting touch DNA and epithelial cell samples unchanged. However, when the government seeks to examine the cells for something more than those loci utilized only for identification, the government must establish a separate need to do so, thus preventing a search of one's personal information collateral to a permitted search and seizure. While some courts have rejected the argument that testing DNA is a search, these decisions were based on testing for identification.[241] This question was largely unanswered in *King*, as the majority opinion rested upon the assumption that DNA testing only revealed identification and no other genetic traits.[242] Justice Kennedy, writing for the majority, further asserted that statutory protections prevented any further invasion of privacy.[243] This must be adjusted for the new technologies.

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[233] Leary, *supra* note 181, at 364.

[234] 134 S. Ct. 2473 (2014).

[235] 565 U.S. 400 (2012).

[236] 533 U.S. 27 (2001).

[237] 133 S. Ct. 1958 (2013).

[238] *See* California v. Ciraolo, 476 U.S. 207 (1986) (helicopter); United States v. Karo, 468 U.S. 705 (1984) (beeper); Katz v. United States, 389 U.S. 347 (1967) (telephone).

[239] *See Riley*, 134 S. Ct. 2473 (cell phones); *Kyllo*, 533 U.S. 27 (thermo-imaging); *Jones*, 565 U.S. 400 (GPS).

[240] For an excellent discussion of the inconsistent approach toward privacy and a critique of *King*, see Maclin, *supra* note 117, at 307–12.

[241] *See supra* Part III.

[242] 133 S. Ct. at 1979.

[243] *Id.* at 1979–80.

A. A New Framework: Information Is Distinct from Objects

Riley v. California held that a search of a cell phone incident to arrest without a warrant was unreasonable.[244] Although an important holding, perhaps more important in today's digital age is the Court's categorization of different searches conducted by law enforcement. *Riley* offers a new framework that distinguishes between searching the physical phone and searching the more intangible information it contains or to which it connects.[245] In so doing, the Court adopted clear Fourth Amendment principles to these different types of searches. The Court applied the well-known balancing test to determine the reasonableness of a police action: "by assessing, on the one hand, the degree to which it intrudes upon an individual's privacy and, on the other, the degree to which it is needed for the promotion of legitimate government interests."[246] The Court found that searching the physical phone was reasonably done in the context of an arrest without a warrant.[247] However the search of the *digital* contents of the phone required a warrant.[248] In drawing this distinction, the Court recognized the quality of the privacy of the information—i.e., the more private the information, the more protected it is.[249] Finding that the phone could contain or be a portal to highly private information in the form of intangible digital data, the Court required a warrant.[250]

The basis of this distinction turned on three qualities of digital information, which also apply to DNA and the chemicals within epithelial cells. These include large storage capacity, the type of information contained in that storage, and the pervasiveness of the information therein.[251] Because these qualities are present in the DNA and epithelial cells of all humans, the foundation for the *Riley* approach applies equally as well to these technologies.

Prior to *Riley*, the Supreme Court had allowed the search of any object found on an arrestee's person without a warrant.[252] However, *Riley* recognized that cell phones are different from other physical objects in that other objects, such as a wallet or purse, contain a finite amount of information.[253] A search of a cell phone imposes a much greater intrusion on the privacy of the individual because it provides access to an infinite amount of information.[254] Therefore, this "immense storage

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[244] *See* 134 S. Ct. 2473, 2485 (2014).
[245] *Id.* at 2485–88.
[246] *Id.* at 2484 (quoting Wyoming v. Houghton, 526 U.S. 295, 300 (1999)).
[247] *Id.* at 2485, 2494.
[248] *Id.* at 2484–85.
[249] *See id.*
[250] *Id.*
[251] *See id.* at 2489–90.
[252] United States v. Robinson, 414 U.S. 218, 224–37 (1973).
[253] 134 S. Ct. at 2488–89.
[254] *Id.* at 2489.

capacity" of the cell phone compelled the Court to draw a distinction between seizing the phone and searching the physical object of the phone (in the case of an arrestee, to ensure it is not dangerous) and searching the data within.[255]

The same is true of epithelial cells collected through touch DNA or chemical analysis of trace skin evidence. Prior to these technologies, it was understood that collection of biological evidence would only yield a DNA profile of "junk DNA" which, in turn, would only provide identity information.[256] This is a limited amount of information and, thus, the privacy intrusion was considered minor. Balanced against the government interest in identifying a perpetrator or ruling out other suspects, such a collection of evidence and analysis was reasonable. Now, however, the amount that can be learned through increased analysis of other loci as well as chemical interpretation of skin traces is also immense and poses a significant privacy intrusion.[257] Distinguishing, therefore, the collection of such cells and the analysis of them beyond identification of the DNA is supported by this concern. Indeed, the Court recognized in the context of chemical analysis of bodily fluids that examinations that reveal health facts are searches.[258]

The second basis for the *Riley* distinction is the type of information contained in the data on the cell phone. By that, the Court focused on three qualitative aspects of the data: that it "collects in one place many distinct types of information . . . [and] allows even just one type of information to convey far more than previously possible," and that the data can date far back into the past.[259] These three qualities combined to allow "[t]he sum of an individual's private life [to] be reconstructed."[260] The same can be said of the evidence at issue in this case. Indeed, advocates of this chemical analysis assert its value is not only identification but that it can "develop a lifestyle sketch of the person who has touched the object[ ]."[261] By amassing information about a person's genetic traits, medication, product use, and diet, much can be pieced together to learn about this person's most personal health status, lifestyle, sexual orientation, habits, and practices. Therefore, these concerns in *Riley* about piecing together disparate aspects of one's life found in the data apply as well to the information found in a chemical analysis and expansive genetic examination of the cells found through touch and transfer.[262]

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[255] *See id.*

[256] *See* Nicholas v. Goord, 430 F.3d 652, 670 (2d. Cir. 2005).

[257] Pike, *supra* note 67, at 1984–85 ("[I]t is possible to discern an individual's entire genetic sequence from a single cell contained in a stored biospecimen—and we do not yet know the limits of what an individual's genetic sequence can reveal." (internal citations omitted)).

[258] Skinner v. Ry. Labor Execs.' Ass'n, 489 U.S. 602, 617–18 (1989).

[259] *Riley*, 134 S. Ct. at 2479.

[260] *Id.* at 2489.

[261] Bouslimani et al., *supra* note 12, at E7647.

[262] *See* 134 S. Ct. at 2489.

Indeed the DNA cases throughout the country echo this distinction. As discussed *supra*, although many courts have held that the testing, retention, or matching of DNA profiles is not an unreasonable search without a warrant, they have based these holdings on the fact that the defendant cannot establish a reasonable expectation of privacy in an identifying characteristic.[263] When defendants have raised concern about access to personal data, courts have rejected such arguments as speculative.[264] With the advent of these technologies, it is no longer speculative.

The Court's final basis for the distinction between the object seized and the information therein, was the ubiquity of cell phones.[265] Because most people possess a cell phone with these characteristics, "[a]llowing the police to scrutinize such records on a routine basis is quite different from allowing them to search a personal item or two in the occasional case."[266] While the Court found relevant that 90% of Americans possessed a cell phone, 100% of humanity possesses DNA filled epithelial cells. Consequently, the concern that the government could routinely search this data for personal information is valid.

Finally, *Riley* was concerned with the age of information.[267] Because access to a cell phone could reveal information years old, the Court noted the level of intrusion was significant.[268] Similarly, this information is in some ways eternal. Obviously, genetic traits have no time limit. But chemical analysis of skin trace evidence has identified chemicals several months old.[269] Therefore, the same concerns in *Riley* are present here.

Although *King* held that DNA collected from an arrestee was not an unreasonable search, this proposed solution is not inapposite to that finding.[270] *King* limited its holding to the collection and analysis of DNA solely for the purpose of identification.[271] This proposed solution is based on a different scenario in which the government seeks to analyze the sample for far more than identification. Such would be unreasonable as, unlike *King*, this search is a more substantial privacy invasion and requires a more compelling government need for this private information and likely a search warrant.

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[263] *E.g.*, Raynor v. State, 99 A.3d 753 (Md. 2014); State v. Athan, 158 P.3d 27 (Wash. 2007).

[264] *E.g.*, Commonwealth v. Smith, No. 521 EDA 2015, 2017 WL 2351517, at *3 (Pa. Super. Ct. May 31, 2017).

[265] *Riley*, 134 S. Ct. at 2490.

[266] *Id.*

[267] *See id.*

[268] *Id.*

[269] Bouslimani et al., *supra* note 12, at E7647.

[270] *See* 133 S. Ct. 1958, 1965–66 (2013).

[271] Professor Maclin argues that *King* is even more disturbing in shed DNA cases because such targets are not arrestees and are unaware of the search, and because the purpose of the search is to solve a crime, not just simply identification. Maclin, *supra* note 117, at 296–97.

B. Distinguishing the Well-Accepted Traditional DNA Analysis from Touch DNA Analysis for More Invasive Information and Chemical Interpretation of Skin Cells

These important characteristics of cell phones—specifically that the object itself allows access to a vast quantity of highly personal information (either because it contains or is a portal to a cloud with such information), causes the Court to draw an important distinction. It distinguished the object—the phone—from the information within—the data. As such, it found reasonable and allowed the seizure of the phones and examination of the physical aspects of the phone incident to arrest under the current Fourth Amendment jurisprudence, but not a search of the data within.[272] The collection of epithelial cells or the DNA itself is akin to the collection of the physical object.

Similarly, the now rote DNA testing to develop a profile only for identification is also allowable. As *King* illustrates, the ability to connect physical evidence to an individual is essential in criminal investigation and exoneration.[273] The government interest is significant and the intrusion on the individual is minimal.[274] Although *King* acknowledged "the full potential" of DNA analysis was yet to be known, it unreservedly underscored its unparalleled utility for identification.[275] While *Kyllo* saw the importance of anticipating and addressing the future potential of the technology at issue, *King* took a decidedly different approach.[276] These cases are in tension, but the world has changed significantly even in the relatively short time frame since 2001 when *Kyllo* was decided. Technological change is occurring at an exponentially rapid pace. Arguably, in some technologies, the Court cannot wait to decide a legal issue, but in others it can draw distinctions and develop workable rules. It did so in *Riley* by drawing a distinction based, not on the technology itself, but on the purpose of the search and depth of the government inquiry.[277] By doing so with touch DNA and related technologies, meaningful distinction can be made between collecting DNA and other cells for the limited purpose of determining

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[272] The search incident to arrest doctrine is an exception to the warrant requirement. United States v. Robinson, 414 U.S. 218, 224 (1973). Here, the exception to the warrant requirement would depend upon the situation. *See id.* at 224–26. If collecting touch evidence from the crime scene, it would be abandoned. If collecting from an object known to have been touched by a suspect it would also, albeit more controversially, be allowed as "shed DNA." If collected due to a person's status as an arrestee, convict, parolee, or probationer, it would be allowed under *Maryland v. King*. 133 S. Ct. 1958, 1969 (2013).

[273] *See* 133 S. Ct. at 1972–73 (finding that the government does have a legitimate interest in knowing whether an arrestee has committed another offense).

[274] *Id.* at 1977.

[275] *See id.* at 1966.

[276] *Compare* Kyllo v. United States, 533 U.S. 27, 42 (2001) (Stevens, J., dissenting), *with King*, 133 S. Ct. at 1966.

[277] *See* 134 S. Ct. 2473, 2485, 2487 (2014).

identification and analyzing that evidence for more personal information now accessible through genetic testing and chemical analysis of skin traces.

Thus applying the reasonableness balancing test, the *King* examination of DNA, for identification only, is not demanding of a warrant.[278] Such an examination can only reveal a piece of information of significant importance to the government. In the case of cell phones incident to arrest, the examination of the phone itself to determine it is not a weapon and perhaps to allay concerns of any likelihood of evidence destruction demanding further action under exigent circumstances similarly demands no warrant.[279]

King consciously decided the issue of DNA collection from an arrestee notwithstanding potential future technological advances.[280] However, it also drew this critical distinction between DNA analysis for identification and other purposes, stating that "[i]f in the future police analyze samples to determine, for instance, an arrestee's predisposition for a particular disease or other hereditary factors not relevant to identity, that case would present additional privacy concerns not present here."[281] That is the case with touch DNA and chemical analysis of skin traces. Once the examination exceeds that immediate purpose, then the government must demonstrate a need for the further information. In *Riley*, that meant obtaining a warrant with probable cause to search the data on the phone.[282] In this context, it presumably would mean a warrant to search for other genetic information or chemicals within the skin traces.[283]

CONCLUSION

Touch DNA and chemical analysis of skin trace evidence will become powerful tools for investigations of criminal matters. As such, the government interest in using the techniques is strong and, concomitantly, the risk to privacy is substantial. Under the current state of the law, this evidence can be treated as abandoned or allowed to be collected through other means and, once collected, the analysis of it is possibly without limits. This is unsustainable. Suspects—and indeed any source of this evidence—risk the government examining on the genetic and molecular level such samples to learn deeply private information without justification. They further risk abuse of the use of this information obtained without any Fourth Amendment

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[278] *See* 133 S. Ct. at 1979–80.

[279] *Riley*, 134 S. Ct. at 2485–88.

[280] *See* 133 S. Ct. at 1979.

[281] *Id.*

[282] *See* 134 S. Ct. at 2485–86.

[283] It should be noted that, as DNA testing for identification becomes more readily available to the citizenry, the use of technology by the government poses even fewer privacy concerns. *See* Kyllo v. United States, 533 U.S. 27, 40 (2001).

constraint. As the practice develops, this risk to privacy cannot be contained to simply criminal prosecution. Rather, defendants can seek this information to intimidate witnesses and victims with the threatened (implied or explicit) exposure of highly personal and private aspects of the individual's life.

The framework now exists, however, to maximize the power of this approach and minimize the risk to privacy. It comes from distinguishing between seizing and searching the container of this information—the trace evidence—and the testing of the evidence for personal matters beyond identification. Under this regime, law enforcement could continue to obtain the trace evidence and test it for identification. In other words, they could continue to treat such evidence as a limited source of identification evidence such as a fingerprint. However, if the government seeks to do more—to genetically and chemically examine the vast information contained therein—it must obtain court approval. Such an approach adopted for cell phones in *Riley* could apply to this emerging practice and balance the government interest in the most accurate and efficient crime scene analysis against individuals interest in protecting the intimate details of one's life.