Journal of the Indiana Academy of the Social Sciences

Volume 17 | Issue 1 Article 4

2014

The New Frontier: Genetic Analysis and the Concept of Rights Infringement

Tyler Counsil
Oakland City University

The New Frontier: Genetic Analysis and the Concept of Rights Infringement

TYLER COUNSIL
Oakland City University

ABSTRACT

Major highlights of genetic analysis and its implications in the field of forensic science are discussed at length, including the discovery of polymerase chain reaction and the importance of one's genetic material as criminal evidence**.** A discussion of recent trends in molecular techniques will give way to a necessary dialogue regarding the potential pitfalls pertaining to overinvestment in genetic profiling. Major topics of debate include the use of arrestee databases, constitutional rights infringements through molecular analysis, and unwarranted evidence collection.

KEY WORDS DNA; Polymerase Chain Reaction; Arrestee Database; Evidence Collection

The popular allure of technological advancement can perhaps be best summarized by a thought from science-fiction novelist Arthur C. Clarke, who noted, "Any sufficiently advanced technology is indistinguishable from magic" (McCracken 2009:1). Clarke's statement certainly seems to hold weight; any new technology made available to society always seems to captivate our minds and hold our hearts still for a fleeting moment. On television, one may switch to almost any given channel and find topical shows focused on new and amazing medical, industrial, or even fictional technology. Even the most novel advances in technology will eventually lose their shine as individuals get away from the enchanted feeling through commonplace, everyday use of these advanced pieces of equipment or methods. It is in this moment of reality that we finally see the potential complexities and problems regarding the use of such forward-thinking ideas.

The discipline of forensic science may be one of the best examples of the above notions. Over the past few years, this area of inquiry has been the darling of both television and new college program initiatives. More recently, however, as Bartos (2012) and Tam (2012) have argued, the field of forensic science has begun finding itself gleaning some scrutiny from critics who believe that such overwhelmingly powerful scientific methods and the persons wielding these tools cause more harm than benefit to society in many instances.

Bartos, for example, cited the fact that many laboratories require minimal standards for evidence processing and analysis; in fact, Bartos, a journalist by trade, was

able to obtain a certification in forensic consultation from the American College of Forensic Examiners International, Inc. (ACFEII) within mere hours. This seeming lack of stringent requirements necessary for one to become a forensic specialist has led to concerns regarding the employment standards and educational competency required for hire to a given forensic laboratory in the United States and beyond. Bartos used the fact that Seymour Schlager, convicted of attempted murder, was able to obtain ACFEII certification as a highlight to the issue associated with the popularity of forensic science in today's society and the lack of standards in forensic education and employment. With forensic scientists the world over acting as "expert witnesses" who may sway the minds and hearts of a jury in favor or against a defendant, such an example regarding employment requirements for being a forensic consultant is both disheartening and alarming.

Aside from hiring issues, the overuse of DNA technology in a criminal case is also becoming a major issue in the debate. As Tam observed, issues arise when DNA profiles are collected from any possible suspects at a crime scene and the DNA itself is used to bring a person in for questioning with no other corroborative evidence indicating that the person being interrogated has committed the crime. As an illustration of this problem, consider a crime that may occur at one's place of employment. The DNA of an employee present at the institution where the crime has occurred will likely be present throughout the workplace, especially if the offense has been committed in a high-traffic area in the building where the employee frequents because of the employee's unique work routine. As a result, this employee may be asked for a swab of their DNA to "exclude" them from the crime scene.When the profile syncs with the DNA collected at the scene, however, this person becomes a suspect simply because their genetic profile was present at the area in which a crime occurred. As a result of over-reliance on DNA evidence in the case, the employee with no ties to the crime is brought into the precinct and must explain why their genetic material was present at the scene, with no other supporting evidence indicating guilt or suspicion of the deviant act under investigation.

Tam's concerns bring up a significant question for forensic science today: Is DNA technology in a forensically relevant setting infringing upon the constitutional and private rights of those protected by the law?

MOLECULAR EVIDENCE COLLECTION AND TECHNOLOGY: TOOLS FOR JUSTICE, OR RESTRAINTS TO LIBERTY?

The issue lying before the citizens of the United States today is whether technology has esoterically indoctrinated each individual to such an extent that humanity has willingly accepted new equipment, techniques, and methods to combat crime or to ease one's measure of living while simultaneously excising the personal freedoms that this country has fought so hard to maintain, much like a daft surgeon removing a piece of perfectly healthy tissue. With ambiguous terms such as "War on Terror," "War on Drugs," and "War on Crime" still lingering in the air and on the lips of bureaucrats throughout the nation, the criminal justice system has long sought to gain greater control

over the monitoring and preventive processes that help diminish crime so as to achieve an effective victory in these intangible and evolving battles against thematic deviance. For example, the controversial Project PRISM surveillance project, which monitors all private data from nine major companies, was established in 2007 (Atherton 2013). The program allows for the federal government to by and large bypass many formerly held privacy restrictions provided by these large Internet companies to access an individual's sensitive information in the event that a person may be perceived as a threat to national security (Lee 2013). Although Project PRISM is arguably the most scrutinized surveillance venture the federal government has been required to defend to date, the issue of privacy rights and the use of surveillance technology is a widespread concern at both the federal and state levels.

The U.S. government has been active recently in upscaling its surveillance capabilities beyond the scope of Project PRISM, which could have serious implications on the privacy rights of citizens both in the United States and beyond. For instance, the National Security Agency (NSA) has been placing spyware and malware programs in computers purchased by suspect individuals whom the government wishes to monitor more closely (Sottek 2013). These types of software programs are typically used by criminals to steal sensitive information, such as credit card details or passwords, from citizens' online devices. As such, the U.S. government has been implicated in the interception of suspicious persons' computer purchases so they may upload these malicious programs to better facilitate their surveillance needs. Unfortunately, the concerns for privacy and technology with our personal electronic devices do not end here when it comes to the government's thirst for information on the civilians under its authority. So-called monitoring centers are being developed by major technology manufacturers, such as NICE Systems, Ltd., and Verint Systems, Inc., with the purpose of allowing government buyers to gain access to virtually any electronic platform that a citizen in question might use to correspond with other parties who may be of interest to national security (Silver and Elgin 2011:1). These monitoring programs can perform a wide range of surveillance activities, such as intercepting text messages and e-mails in addition to secretly activating webcams or microphones that would normally require user interaction for use, all in the name of keeping the United States safe. Although one may believe that the federal government is alone in its use of privacy-infringing technology, one may be surprised to learn that such innovative equipment is slowly trickling its way down to lower levels of government, too.

For instance, Ohio-based company Persistent Surveillance Systems has been creating aerial-based monitoring services that would provide constant surveillance to cities and towns so state and even local officials could track the movements and actions of questionable citizens for extended periods, unbeknownst to the suspect individuals, via cameras attached to aircraft flying around a targeted location (Timberg 2014). The technology has already been used in political campaign events across the nation to identify potential threats to candidate safety by state agencies, and Persistent Surveillance Systems has been making a push to get the technology into the hands of local law enforcement personnel across the United States. Surveillance technology such as facial-

recognition software is already in use via closed-circuit television (CCTV) cameras across street corners in multiple cities by local law enforcement agencies, and even at famous amusement parks such as Disneyland (thereby allowing quick access to one's credit card information for spontaneous purchases), thus illustrating the fact that the federal government is not the sole agent of possible rights infringement (Wolf 2012). While cybercrime is an ever-growing concern, given that nearly $100 billion is lost each year to electronic crimes, thus amounting to over 500 million victims annually, it is understandable that new strategies in surveillance and evidence collection are needed by federal, state, and local policing agencies to combat this crime epidemic (Go-Gulf 2013).

Thus, one can determine that multiple levels of U.S. government are focusing their collective sights on any technology that can improve policing techniques that may combat the threat of modern cybercrime, which leaves virtually no evidence behind, and certainly presents a disconnect from traditional investigation rife with physical evidence such as fiber strands, DNA, and the like to connect a guilty party to the criminal act. Even though a disconnect may appear to exist between technology and conventional crime committed in the physical world given the overabundance of technological practices being used to combat digital crime, one might be surprised to find that technology is in fact starting to make its way into traditional investigative practices. As a result of the growing demand for technology to be used in all criminal matters so as to improve investigative efficiency while diminishing uncertainty that may result in erroneous convictions, analytical tools steeped in molecular practices are poised to be the next wave of technology-heavy processes that the government may be readying for use to combat crime more effectively.

Molecular analysis (e.g., DNA, RNA detection) has often been thought of as a tool that greatly improves the criminal investigation process overall, yet it has taken approximately twenty years and several recent advances in the technology to finally open the nation's collective eyes to the fact that blatant issues with personal rights are at stake each time a swab of genetic material is taken from one's cheek or extracted from a sample retrieved from a crime scene, for example. It is important to discuss these issues regarding rights infringement so as to direct molecular analysis back onto an appropriate path of usefulness in the criminal justice system, before such analysis goes so far down the wrong trail that it becomes irredeemable.

Recently, there has been considerable movement toward a universalized, general population-based DNA database in the criminal justice system. To think otherwise would be foolish; 28 states and the federal government currently have in place laws that allow for the collection of DNA in arrestees—that is, those persons arrested in connection with a crime but yet to be proven guilty in a court of law (National Institute of Justice 2013). Thus, federal and state legislators believe that a person arrested under probable cause must surely be entangled in the criminal matter far enough that the person must submit a sample of their genetic profile for comparison to the evidence gathered at the crime scene. As such, a universal database is being created without officials specifically knocking from door to door and expending large amounts of state budgets (Guillen et al. 2000). Instead, anybody arrested is simply logged into the system from a genetic

standpoint. Such a practice seems contradictory to the phrase "innocent until proven guilty," as the submission of DNA with little more than the act of being arrested and charged for a crime indicates a high probability that those investigating the case believe the person to be guilty before the facts are presented in a court of law where the suspect-turned-defendant can be judged by a trial of peers.

The U.S. Supreme Court investigated the issue of arrestee databases, as issues regarding the safety of the public are met with growing concern over privacy rights infringed upon through the use of these arrestee databases. The rights regarding one's privacy, physical and moral integrity, and the presumption of innocence are potential human and civil rights under fire through the prescription of arrestee databases, and as such, the final dispensation on the matter has been passed to the ultimate authority of our nation's laws so as to constitute the final ruling regarding the issue (Guillen et al. 2000). In particular, the U.S. Supreme Court heard the matter recently because of concerns that citizens' Fourth Amendment rights, regarding unreasonable search and seizure of evidence, are being infringed as a result of arrestee databases (Rosenthal 2012). In a 5-4 ruling, the justices of the Supreme Court ruled that arrestee databases are in fact a legitimate part of the police booking process, citing that the collection of genetic material is akin to the acquisition of fingerprints following a probable-cause arrest of an individual (Mears 2013b).

The controversial ruling by the U.S. Supreme Court comes after Maryland's state supreme court in the case of *Alonzo Jay King, Jr. v. State of Maryland* held that DNA acquisition prior to conviction does violate one's Fourth Amendment rights (Maryland Courts 2011). In light of the Supreme Court ruling, privacy rights groups are fearful that although the genetic information may be for criminal purposes only at the current moment, it could soon be "applied for a variety of non-criminal purposes" (Mears 2013a:1). The fear is that one's information could be used in other criminal justice-related subdivisions for unrelated research or analysis without the consent of the person submitting the information; moreover, there is the issue of lax rules regarding the dispensation of the evidence, thereby leading some to believe that their genetic profiles could be sold to other parties, such as medical or biotechnology businesses, to be used to help bolster profits for all parties involved in the transaction save for the individual uniquely tied to the DNA collected. With the DNA of 10,867,894 criminal profiles, 547,682 forensic profiles (in which the offender is still at large), and 1,830,544 arrestee profiles, along with 220,126 profiles of Indiana criminals alone in the National DNA Index System (NDIS) as of 2014, the concern for privacy becomes readily apparent based on the sheer number of individuals within our federal and state databases that are potentially at risk of having their DNA used for more than investigative purposes (FBI 2014).

Some scoff at the idea that one's genetic material would be used for ulterior motives in the criminal justice system or by the federal government, but they only need look at the policy for expungement of an arrestee's genetic information to see the potential for abuse. Although all states have a means to remove a DNA profile from record upon dismissal or acquittal of any charges in a criminal matter, most require the

arrested person to initiate the process and to follow through with the eradication of the genetic fingerprint on file; as such, very few individuals actually follow through with the procedure, and as a result, DNA profiles for arrestees are often left in the system as a permanent fixture of a state's arrestee database (National Institute of Justice 2013). Hence, an individual's genetic profile could certainly be used for alternative purposes if said individual does not execute the expungement process, as that information remains in the database of the state otherwise. As a result, it is obvious that Fourth Amendment rights regarding genetic-evidence collection are clearly in need of inspection by a higher judicial authority.

The use of one's genetic information for additional purposes is in fact *the* cornerstone of the debate regarding Fourth Amendment violations. Some might argue that these additional uses are even more invasive upon one's rights to privacy than is the initial forced acquisition of DNA from an arrestee. The overarching thematic problem surrounds the fact that most states refuse to eliminate innocent profiles from their respective arrestee databases, as already indicated in their expungement legislation. The issue with failing to remove the profiles from these state databases is that one's privacy will continue to be abused through policing techniques that continue to utilize one's DNA fingerprint in future investigations, thereby always calling that formerly arrested individual into question as a possible suspect, even if for a transient moment.

For example, law enforcement officials may instigate a "DNA dragnet," whereby agency personnel may begin to scan their local databases for exact or partial matches to the evidence collected from a new case or a cold case, for example (Simoncelli and Krimsky 2007:1). With this technique, anybody's profile still in the system may be scanned and the individual's privacy may come under threat again if law enforcement believes that a strong enough match between evidence in an unrelated case correlates to the information about an innocent person that, by chance, was still kept in the database. Fourth Amendment conservationists are also concerned by the prospects that one's DNA may be used to create a phenotypic or physical appearance profile as well.

As mentioned earlier, DNA can be used to determine hair and eye color, as well as skin color (ethnicity), possibly. Once again, a search of one's DNA left in a database could pick up a match to similar physical features between new evidence collected and one's old, innocent profile left dormant in the system (Simoncelli and Krimsky 2007). The implications of comparing an individual's DNA to determine physical makeup with innocent profiles left in the system could be dangerous, as implications of a racist dragnet come to mind, in which law enforcement target specific ethnic groups or those matching physical depictions based on DNA results (Silverstein 2013). With law enforcement and legislation already combating notions of bias and discrimination, the use of a DNA database to racially profile persons of interest is certainly a matter of concern not only for Fourth Amendment consideration, but for major civil rights violations as well.

The Fourth Amendment problems continue to build when one considers the concept of partial-match analysis from state DNA databases (Simoncelli and Krimsky 2007). A suspect may be targeted and arrested when their DNA is implicated in another

crime upon showing up as a partial, or genetically related, match when the samples from this crime are run through an arrestee database. Take for example the case of the Grim Sleeper, a notorious serial killer operating out of Los Angeles for approximately two decades (Sher and Karlinsky 2010). Frustrated with the inability to solve the rash of murders at the hands of this murderer, the Los Angeles Police Department decided to make up for inability to solve the case using traditional casework by running evidence from the killings through its arrestee database; what came up was a partial match to an individual already in the system for criminal deviance. Precisely, the match was that of a parent-child relationship based on a comparison of the unknown suspect's profiles in the murders with that of the arrested individual already on file with the LAPD (Dolan 2010). As a result, an unwarranted (and possibly unconstitutional) search for the parent of the already enlisted arrestee was executed in an attempt to find the so-called Grim Sleeper.

The search was narrowed as a result of parentage-based DNA analysis, which used an arrestee database examination to discover a partial match to the offender's father, Lonnie David Franklin Jr. Upon monitoring Franklin Jr., undercover investigators found the suspect consuming food from a local street vendor; upon completion of his meal, Franklin Jr. discarded the remains of his pizza treat to a public waste receptacle, from which the undercover agents withdrew said remnants of the meal for DNA testing (Dolan, Rubin, and Landsberg 2010). Thus, the Fourth Amendment rights infringements in the case of the Grim Sleeper are twofold: the use of the arrestee database to narrow the suspect list via partial match, and the happenstance collection of DNA evidence from a public waste receptacle without warrant in the matter.

The latter concern of "surreptitiously collecting and searching DNA evidence left behind on items" is one that also brings into question one's true rights to unwarranted investigation through the Fourth Amendment (Simoncelli and Krimsky 2007:1). Legal critics and prosecutors able to solve older cases such as the Grim Sleeper investigation cite that no specific legal boundary is being violated and that an individual should expect that any genetic material shed in public (e.g., skin, hair, saliva) to be admissible in any investigation, thereby losing the expectation of privacy while moving about freely in society (Associated Press 2013). While the Fourth Amendment does allude to exemptions from its unnecessary search and seizure stipulations through situations such as exigent circumstances and the plain view exception, it is the precise lack of definition regarding DNA evidence in these scenarios that allows law enforcement and prosecutors to continually abuse these circumstantial cases and to take evidence from public places without a strong case of probable cause warranting the investigation of the person in question (Lushbaugh and Weston 2012). This point of contention—the idea that "the government's interest in collecting a DNA sample from a person facing charges outweighed [sic] any intrusion of privacy"—is an issue still hotly debated in the realm of adjudication, as the cases of *United States v. Pool* and *United States v. Mitchell* clearly indicate (Henning 2010:2). Until consensus is garnered regarding the interpretation of the Fourth Amendment and the need for DNA evidence in solving cases, both new and old alike, it seems that one's privacy concerns are still subject to investigative duress.

The concept of being guilty before proved innocent has worsened beyond perceived guilt upon submission of genetic evidence by the arrestee or through the abuse of arrestee databases and unwarranted DNA evidence collection in public-access places; as genetic analysis has found greater footing in the field of forensic science, different methods of interpretation following the potentially unconstitutional acquisition of such evidence serve to skew the truth behind the analysis to create the answer needed by those attempting to sway jurors and judges alike in a given criminal case. In fact, some individuals believe that DNA evidence in particular can create "victims of chance" (Geddes 2010b:1). Charles Richard Smith in Sacramento, California, can attest to the power of statistical interpretation of DNA evidence—it earned him a 25-year incarceration sentence (Geddes 2010b). Specifically, Smith was arrested and convicted on charges of sexual assault; upon his arrest, investigators retrieved DNA evidence from Smith's genitalia and had it analyzed to find that it had a mixture of DNA from both Smith and another individual, the latter profile allegedly being that of the victim in the case. During the trial, four statistical interpretations alluding to the probability that the second profile pulled from Smith's body was that of the victim manifested, with the likelihood ranging anywhere from a 1:95,000 chance (slim) to a 1:13 chance (highly likely) that the victim was assaulted by Smith (Geddes 2010b). Thus, the mathematical or statistical interpretation alone of a singular piece of evidence—the likelihood of the profile on Smith's body being that of the victim in the sexual assault case—alone can exonerate or condemn a person. As of today, there are no consistent guidelines for statistical analysis of genetic evidence, meaning that DNA evidence may be weighted in a highly subjective manner in such a way that benefits those seeking to gain from its interpretation, whether the defense or the prosecution (Geddes 2010a); thus, one's liberty and ability to remain a free citizen in our society may hang in the balance of a mere mathematical equation and the interpretation thereof by freewheeling and downright subjective principles currently governing molecular evidence analysis.

Statistical inadequacies alone are not the only problem with post-arrest analysis of genetic material. In fact, analysis of a DNA profile to indicate a match between a possible suspect and evidence analyzed from the scene of a crime is scientist- and laboratory-dependent. Forensic science laboratories often establish their own standards for how strong or high a match must be between two samples under comparison; thus, the difference between freedom and incapacitation may be the variable threshold pattern that each lab sets when determining a match between genetic fingerprints derived from evidence (Geddes 2010a). The subjectivity of result interpretation has long been a concern with the use of genetic evidence.

In a study of 137 cases in which forensic testimony was used to interpret data rendered from evidence analysis, a staggering 60 percent of the cases were observed to have issues with invalid forensic science testimony, in which the scientists charged with analyzing the information for jurors either made errors in statements pertaining to the true conclusions garnered from the evidence or made false statements unsupported by the evidence used in the trial (Garrett and Neufeld 2009). Again, the subjectivity of the individuals analyzing the evidence itself can have profound effects on the dispensation of

one's freedom in our twenty-first-century society. The problem is twofold: Many individuals not savvy to the field of forensic science accept the information presented in a court of law as factual, and the lack of demand for standards and accreditation result in variability of evidence interpretation.

Too often, jurors, judges, and even attorneys associated with a case believe that forensic evidence has been interpreted by a laboratory staffed with professionals who use rigorous statistical models and universal techniques that do not vary from laboratory to laboratory, but this is not the case, as one can determine from the aforementioned issues with subjective interpretation of evidence (Frontline 2012). In addition, many forensic laboratories are not certified or accredited by any authority that ensures that the lab's work is paralleled by any universal guidelines or standards; as such, these labs are individualized in everything ranging from employee qualifications to interpretation of scientific findings (Frontline 2013). As a result, what society believes to be a rigorous professional means to solving criminal cases is, in fact, governed, by and large, by idiosyncratic and, at best, questionable professional scruples.

With all of these problems plaguing the current forensic science system, and in particular the methods associated with genetic evidence analysis, one may ponder how such a twisted system could ever be untangled from connotations of unprofessionalism and rights violation to become the prudent source of investigative methodology that society so deserves. To that end, three major turning points could certainly help rectify the state of molecular analysis. The first step to righting the perceived wrongs that genetic analysis has imbued upon society is to empower those currently held up in the DNA arrestee databases through easier expungement procedures.

Because much of the issue with DNA misuse today is a result of laboratories and law enforcement being privileged with an overabundance of genetic profiles akin to a general population database, it is important to keep the general public educated on their ability to reclaim their genetic information so it does not continue to cause them concern from a privacy or civil rights standpoint. "Even if the Supreme Court upholds arrestee DNA collection laws, DNA expunction laws should be reformed to ensure automatic expunction" (Burke 2013:4). If states are genuine in their desire to help those whose charges are dismissed or acquitted and they seek to maintain the DNA fingerprints of only those who are genuine offenders, automatic expungement upon charge elimination is a logical response over forcing the defendant to continue to deal with issues associated with the arrest after having been deemed innocent through adjudication.

Another issue to consider involves the fact that although DNA profiles may be removed from a state or federal electronic database, the evidence holding the DNA could still be available for reanalysis. The federal legislation surrounding the FBI's CODIS system states that only the profile may be expunged, while evidence still holding an individual's genetic imprint may not be destroyed (Burke 2013). In an effort to improve perceptions of an honest criminal justice system and the use of DNA or RNA for criminal matters only, it is imperative that future legislation specifically outline the dispensation not only of electronic DNA profiles but also of the physical evidence containing one's

genetic material, making sure to explicitly justify any decision for continued preservation of said physical material, or to at least establish a statute of limitations upon which such evidence may be eliminated. This type of legislation should be doubly important for cases in which the individual who submitted the genetic information is found to be innocent of all charges rendered in a criminal case.

The second improvement to be instigated in the realm of forensic science to help reestablish genetic analysis as a tool with merit is to begin the process of complying with Fourth Amendment stipulations and requirements. Two doctrines under the Fourth Amendment currently serve as tests for lower court decisions that have ruled against public collection of DNA and DNA arrestee databases; these doctrines are the "totality of circumstances" and "special needs" doctrines (Eilier 2011:1203). Regarding the totality of circumstances test, law enforcement agencies and personnel therein must consider more than one or two facts alluding to an individual's perceived guilt and must instead examine the combined circumstances or facts pertaining to an alleged criminal violation before determining if probable cause is in effect, allowing for evidence to be collected via warrant (Moore 1983). The collection of DNA from public sources and after partial matches between evidence from a crime with other individuals in a given DNA arrestee database has been historically accepted because of the novelty of these techniques; however, probable cause is not sufficient in cases in which one's DNA is found at a crime scene. For instance, a crime may take place in a public facility (e.g., restroom or restaurant) where dozens of profiles may be retrieved; the presence of one's DNA alone from these highly traveled places is insufficient evidence to incite the totality of circumstances, and great care in future legislation would certainly help to redefine the use of this doctrine under the Fourth Amendment so that it is no longer so egregiously abused.

The second doctrine often considered when determining if DNA collection from arrestees or public places is constitutional is the special needs doctrine. This doctrine applies when government agencies can illustrate that acquisition of a warrant is impractical, law enforcement interests outweigh the infringement of one's rights, and "the immediate objective of the search is one other than to generate evidence for law enforcement purposes, even if the ultimate goal is non-criminal in nature" (Lexis Nexis 2013:1). Such searches for evidence have historically been focused upon inventory searches, inspections, and checkpoint inspections (Britz 2008). The idea that collecting DNA from a non-convicted arrestee or via public collection is a necessity outside the bounds of normal law enforcement procedure is a stretched abuse of this doctrine at best, as such generalized procedures do not represent necessities beyond normal law enforcement needs but rather serve to make law enforcement and investigative procedures easier through lax interpretation of the law.

Certainly, law enforcement can gather such evidence and remain inside the bounds of the special needs doctrine if "the DNA samples may eventually help law enforcement identify the perpetrator of a crime, [and] at the time of collection, the samples in fact provide no evidence in and of themselves of criminal wrongdoing, and are not sought for the investigation of a specific crime," as held by Second Circuit Court

of Appeals (Eilier 2011:1215); however, in cases such as that of the Grim Sleeper, in which DNA evidence collected publicly for specific use in criminal investigation, this phraseology has been abused and stretched to the limits of its acceptability. Thus, for genetic analysis and evidence collection to remain a trustworthy source of forensic investigation, it is important that legislation of both a federal and a state nature redefine the nature the Fourth Amendment and all applicable doctrines so as to avoid continued rejection by society at large. Given that the U.S. Supreme Court is beginning to hear cases pertaining to these matters regarding DNA use, it is possible that this may be one of the first improvements to manifest in the near future.

Finally, one of the best improvements that could occur in the realm of forensic science to help reestablish genetic analysis as a trustworthy, premiere tool for investigative purposes would be for the nationwide demand for accreditation of all forensic laboratories. With forensics labs utilizing inconsistent methods for statistical analysis and result interpretations, skeptical forensic testimony in court, and states paying millions of dollars in restitution for wrongful conviction, such errors and inconsistencies speak volumes as to the need for this enhancement. The impact of forensic science on one's livelihood can be substantial, and the fact that 63 percent of the wrongful-conviction cases examined by Barry Scheck and his associates were due to forensic testing errors alludes to the need to rectify this crisis immediately (Giannelli 2008). Thus far, accreditation of laboratories tends to be a state-regulated matter.

For instance, the State Police Crime Laboratory System in the state of New York comprises four laboratories and is accredited by an external body—the American Society of Crime Laboratory Directors-Lab Accreditation Board (ASCLD/LAB)—annually through surveillance audits (New York State Police 2013). The state of New York actually mandates, through legislation, that its forensic laboratories be scrutinized and follow the specific testing parameters and guidelines dictated by the ASCLD/LAB. Although accreditation would arguably result in higher costs for analyses and in greater state spending, the idea is to put state finances to better use through rigid management of forensic testing laboratories and to therefore keep the state budget out of compensatory reimbursements given to those wrongly convicted in cases in which sloppy, unaccounted forensic testing was allowed into the courtroom.

CONCLUSION

Forensic science is a powerful tool in the fight against crime, let there be no doubt; however, prior recent inquiries by researchers such as Bartos and Tam and this work strongly suggest that technology has progressed and quickly outpaced the legislation currently in place to protect citizens. With issues pertaining to Fourth Amendment rights, lenient interpretations of forensically evaluated evidence, the continued abuse of individuals' genetic blueprints currently plaguing the criminal justice system, it is imperative that society collectively voice its concern for a higher standard of investigative practices. The criminal justice system and all applicable legislation were built by humanity and as such can be modified and perfected by humankind.

In addition, the concept of DNA analysis is a human construct. As such, DNA identification and any applicable technologies can be created by mankind for use in resolving criminal or civil disputes. That said, it is imperative that if we as a society are to accept such powerful techniques to be utilized for the greater societal good, then we must also be willing to examine these novel tools for both the strengths of their use and the implications of social detriment. If an impasse is revealed for a given DNA methodology, then it becomes society's challenge to stand up and determine if the risk of use and loss of rights is less critical than the danger posed to our world by not utilizing this technology.

In short, if genetic evidence collection and analysis is to survive as a golden standard of forensic science, it too must adapt to the changing needs of society or face banishment as an abusive, invasive technique that harmed greater society through wrongful convictions and false conclusions more than it managed to aid in the dispensation of true justice.

REFERENCES

Associated Press. 2013. "Creative DNA Collection Raises Ethical Questions." NBC News. Retrieved November 6, 2013 (http://www.nbcnews.com/id/17669936/ns/us_news-crime_and_courts/t/creative-dna-collection-raises-ethical-questions/#.VAeElekg_IU).

Atherton, Kelsey D. 2013. "A Concise History of the NSA's Online Spying Program PRISM." *Popular Science.* Retrieved November 6, 2013 (http://www.popsci.com/technology/article/2013-06/concise-history-nsas-online-spying-program-prism).

Bartos, Leah. 2012. "No Forensic Background? No Problem." *ProPublica.* Retrieved October 27, 2013 (http://www.propublica.org/article/no-forensic-background-no-problem).

Britz, M. T. 2008. *Criminal Evidence*. Upper Saddle River, NJ: Pearson.

Burke, Catherine A. 2013. "Suspicionless DNA Collection from Arrestees Violates the Fourth Amendment, but Easier Expunction of DNA Records Can Help Mitigate the Harm." *Social Science Research Network*. Retrieved May 31, 2013 (http://papers.ssrn.com/sol3/papers.cfm?abstract_id=2261499).

Dolan, Maura. 2010. "In the Grim Sleeper Case, a New Tack in DNA Searching." *Los Angeles Times.* Retrieved May 31, 2013 (http://articles.latimes.com/2010/jul/10/local/la-me-0710-grim-sleeper-dna-20100710).

Dolan, Maura, Joel Rubin, and Mitchell Landsberg. 2010. "DNA Leads to Arrest in Grim Sleeper Killings." *Los Angeles Times.* Retrieved May 31, 2013 (http://articles.latimes.com/2010/jul/08/local/la-me-grim-sleeper-20100708).

Eilier, A. 2011. "Arrested Development: Reforming the Federal All-Arrestee DNA Statute to Comply with the Fourth Amendment." *The George Washington Law Review* 79:1201–36.

Federal Bureau of Investigation. 2014. "CODIS—NDIS Statistics." Retrieved May 7, 2014 (http://www.fbi.gov/about-us/lab/biometric-analysis/codis/ndis-statistics).

Frontline. 2012. “Judge Harry T. Edwards: How Reliable Is Forensic Evidence in Court?” PBS. Retrieved May 31, 2013 (http://www.pbs.org/wgbh/pages/frontline/criminal-justice/real-csi/judge-harry-t-edwards-how-reliable-is-forensic-evidence-in-court/).

Frontline. 2013. “No National Standards, Little Oversight.” PBS. Retrieved May 31, 2013 (http://www.pbs.org/wgbh/pages/frontline/post-mortem/things-to-know/no-standards.html).

Garrett, B. L. and P. J. Neufeld. 2009. “Invalid Forensic Science Testimony and Wrongful Convictions.” *Virginia Law Review* 95(1):1–97.

Geddes, L. 2010a. “Fallible DNA Evidence Can Mean Prison or Freedom.” *New Scientist.* Retrieved May 31, 2013 (http://www.newscientist.com/article/mg20727733.500-fallible-dna-evidence-can-mean-prison-or-freedom.html?page=2).

Geddes, L. 2010b. “How DNA Evidence Creates Victims of Chance.” *New Scientist.* Retrieved May 31, 2013 (http://www.newscientist.com/article/mg20727743.300-how-dna-evidence-creates-victims-of-chance.html).

Giannelli, P. C. 2008. “Wrongful Convictions and Forensic Science: The Need to Regulate Crime Labs.” *North Carolina Law Review* 86:164–234.

Go-Gulf. 2013. “Cybercrime: Statistics and Trends.” InSecPro. Retrieved May 7, 2014 (http://www.insecpro.com/index.php/articles/cyber-crime-statistics).

Guillen, M., M.V. Lareu, C. Pestoni, A. Salas, and A. Carracedo. 2000. Ethical-Legal Problems of DNA Databases in Criminal Investigation. *Journal of Medical Ethics* 26:266–71.

Henning, A. C. 2010. “Compulsory DNA Collection: A Fourth Amendment Analysis.” *Congressional Research Service*: 7–5700.

Lee, Timothy B. 2013. “Here’s Everything We Know about Project PRISM to Date.” *Washington Post.* Retrieved November 6, 2013 (http://www.washingtonpost.com/blogs/wonkblog/wp/2013/06/12/heres-everything-we-know-about-prism-to-date/).

LexisNexis. 2013. “Administrative and Non-Investigative Searches.” Retrieved May 31, 2013 (http://www.lexisnexis.com/lawschool/study/outlines/html/crimpro/crimpro05.htm).

Lushbaugh, C. A. and P. B. Weston. 2012. *Criminal Investigation: Basic Perspectives*. 12th ed. Upper Saddle River, NJ: Prentice Hall.

Maryland Courts. 2011. *Alonzo Jay King, Jr. v. State of Maryland*, No. 68, September Term, 2011. Retrieved May 31, 2013 (http://mdcourts.gov/opinions/coa/2012/68a11.pdf).

McCracken, Harry. 2009. “The 25 Most Notable Quotes in Tech History.” *Technologizer.* Retrieved May 30, 2013 (http://technologizer.com/2009/11/09/great-tech-quotes/3/).

Mears, Bill. 2013a. “DNA Tests after Arrest? Some Justices Not So Sure.” CNN News. Retrieved May 31, 2013 (http://www.cnn.com/2013/02/26/justice/supreme-court-dna).

Mears, Bill. 2013b. "Supreme Court: DNA Swab after Arrest Is Legitimate Search." CNN News. Retrieved June 4, 2013 (http://www.cnn.com/2013/06/03/justice/supreme-court-dna-tests).

Moore, C. E. 1983. "Fourth Amendment: Totality of the Circumstances Approach to Probable Cause Based on Informant's Tips." *The Journal of Criminal Law and Criminology* 74(4):1249–64.

National Institute of Justice. 2013. "DNA Sample Collection from Arrestees." Retrieved May 31, 2013. (http://nij.gov/topics/forensics/evidence/dna/collection-from-arrestees.htm).

New York State Police. 2013. Crime Laboratory System. Retrieved May 31, 2013 (https://troopers.ny.gov/Crime_Laboratory_System/).

Rosenthal, Andrew. 2012. "DNA and the Fourth Amendment." *New York Times.* Retrieved May 31, 2013 (http://www.nytimes.com/2012/08/06/opinion/dna-and-the-fourth-amendment.html?_r=1&).

Sher, Lauren and Neal Karlinsky. 2010. "New Technique of Using Family's DNA Led Police to 'Grim Sleeper' Suspect." ABC News. Retrieved May 31, 2013 (http://abcnews.go.com/Nightline/familys-dna-led-police-grim-sleeper-serial-killer/story?id=11116381).

Silver, Vernon and Ben Elgin. 2011. "Torture in Bahrain Becomes Routine with Help from Nokia Siemens." Bloomberg News. Retrieved May 7, 2014 (http://www.bloomberg.com/news/2011-08-22/torture-in-bahrain-becomes-routine-with-help-from-nokia-siemens-networking.html).

Silverstein, Jason. 2013. "The Dark Side of DNA Evidence." *The Nation.* Retrieved May 31, 2013 (http://www.thenation.com/article/173554/dark-side-dna-evidence#).

Simoncelli, T. and S. Krimsky. 2007. *A New Era of DNA Collections: At What Cost to Civil Liberties?* American Constitution Society for Law and Policy.

Sottek, T. C. 2013. "NSA Reportedly Intercepting Laptops Purchased Online to Install Spy Malware." The Verge. Retrieved May 7, 2014 (http://www.theverge.com/2013/12/29/5253226/nsa-cia-fbi-laptop-usb-plant-spy).

Tam, Jessica. 2012. "Constitutionality of DNA Testing and Database Cataloguing." Legal Match. Retrieved October 27, 2013 (http://www.legalmatch.com/law-library/article/constitutionality-of-dna-testing-and-database-cataloguing.html).

Timberg, Craig. 2014. "New Surveillance Technology Can Track Everyone in an Area for Several Hours at a Time." *Washington Post.* Retrieved May 7, 2014 (http://www.washingtonpost.com/business/technology/new-surveillance-technology-can-track-everyone-in-an-area-for-several-hours-at-a-time/2014/02/05/82f1556e-876f-11e3-a5bd-844629433ba3_story.html).

Wolf, Naomi. 2012. "Face Recognition: The New Totalitarianism of Surveillance Technology." *Occupy.* Retrieved May 7, 2014 (http://www.occupy.com/article/face-recognition-new-totalitarianism-surveillance-technology).