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J. Clay Smith Jr.

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Whether people realize it or not, genetic engineering has been developing and flourishing at an alarming rate within the last decade alone.[1] What had seemed to be an area of study and interest only for biologists and those scientifically inclined has become an area that all people should at least be superficially aware. In fact, because of the recent strides made in genetic engineering, people cannot afford to be unfamiliar with this field. It is "risky business."[2]

Genetic engineering is now responsible for the "creation" of biotech foods that may soon available in neighborhood supermarkets.[3] In addition, genetic information is also being utilized in some workplaces to discriminate against those employees

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[1] *See generally* J. Clay Smith, Jr., *The Genetic Engineering Revolution: A New Century Reality Bibliographic Index (1981-86)*, 32 How. L.J. 61 (1989).

[2] Elaine Draper, **Risky Business** xii (1991).

[3] The "Flavr Savr" tomato is manufactured by Calgene Fresh, Inc. This tomato contains a synthetic gene that impedes the natural ripening of the tomato so that it stays firm through the harvest and shipping process. While the company has been met with serious opposition by activist groups and those interested in the dangerous implications of such produce, Calgene's vice president of marketing says the company will proceed on schedule. Boyce Rensberger, *Biotech Tomato Headed to Market Despite Threats*, Wash. Post, Jan. 12, 1993, at A3.

whose genetic profiles could pose potential financial risk to their employers.[4] Genetic testing or profiling is also being used in the area of legal investigations. Risks abound in this territory as well.

Though the relatively recent development of genetic profiling has been a beneficial technological advancement in some ways such as determining the father of a child for paternity reasons[5] or finding an unknown assailant in a rape case, or even freeing an innocent prisoner,[6] this new technology can also prove to be

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[4] Though genetic testing has its support by scientists who are excited about this new technology, "critics of genetic testing in the workplace fear the tests will be used to unfairly exclude applicants and employees...[and] will result in invidious discrimination creating a new class of undesirable workers." One problem with genetic testing for employment purposes is that the testing can detect one's predisposition to an illness, however, it cannot predict whether the person will actually contract the disease. Regardless of whether the employee suffers from the disease, employers can use such information to deny employment and promotion because of potential insurance risks and other financial liabilities. Jack F. Williams, *A Regulatory Model for Genetic Testing in Employment*, 40 Okla. L. Rev. 181 (1987).

[5] In a paternity suit, DNA profiling compares the genetic material of a child with the genetic material of the alleged father to determine if the male contributed half of the child's genetic makeup. DNA profiling had been previously rejected in 15 pending criminal cases at the time in the District of Columbia Superior Court Judge George W. Mitchell admitted DNA evidence and other determinants to rule that a former D.C. minister fathered the daughter of a courthouse employee in 1982. *Judge Admits DNA Profiling as Evidence in D.C. Paternity Suit*, Wash. Post, Oct. 30, 1991, at B1. DNA profiling was also used to prove that a child born to a married couple was not fathered by the husband. Batcheldor v. Boyd, 108 N.C.App. 275, 423 S.E.2d 810 (1992).

[6] There have been several instances where DNA testing has actually proved convicted offenders innocent after their incarceration. Glen Dale Woodall was sentenced to two life sentences, without parole, plus 335 for his 1987 conviction of kidnapping and raping two West Virginia women. Although both women identified him as the assailant, the court finally relented to DNA testing using semen specimens found on the women. *DNA Tests Clear Man Imprisoned for Four Years*, N.Y. Times, May 3, 1992, at 30.

dangerous where the results are inaccurate[7] or where results are used for discriminatory purposes. This paper looks at the ominous ramifications of DNA testing, not just for the suspect or defendant, but for all people.

An Overview of DNA Genetic Testing

In a criminal investigation, for example, the purpose of DNA profiling is to draw a correlation between genetic material left at the scene of a crime and the genetic makeup of an alleged suspect to determine whether the suspect perpetrated the offense. As of 1990, however, many aspects of forensic identification had not been thoroughly studied by the scientific community, yet "police and prosecutors have carried out DNA analysis in more than 1,000 criminal investigations in the U.S. since 1987."[8] In analyzing the process used to obtain this information, it is first helpful to lay a brief foundation of the DNA molecule itself and its function.

Imprisoned for nine years, Charles Dabbs fought two years for the semen specimen that proved him innocent of raping his distant cousin. *DNA Frees Convicted Rapist After Nine Years*, N.Y. Times, Aug. 1, 1991, at B1.

[7] Six Irishmen that were convicted of bombing two pubs in Birmingham, England were released 16 years later when it was found that the genetic test, the Greiss test, used to convict them had proved unreliable. Peter J. Neufeld and Neville Colman, *When Science Takes the Stand*, Sci. Am., May 1990, at 46.

[8] The first case to admit DNA profiling as evidence in a criminal suit was Andrews v. State, 533 So.2d 841 (Fla. Dist. Ct. App. 1988). Cases involving DNA in Federal courts date back to 1978, and perhaps earlier. *See* Henry M. Butzel, **Genetics In The Courts** 712-715 (1989)(civil cases), stating, "the legal problems which DNA work may lead to are numerous. They are well summed up by a review in the journal Gene in 1981 (15 Gene 1)."

The term "DNA" stands for deoxyribonucleic acid[9] and is the genetic material found in the nucleus of living organisms.[10] Within the DNA molecule are instructions for the physical makeup of a person. For example, DNA will determine one's eye and hair color, their skin color, their height; anything having to do with their physical characteristics. DNA is stored into twenty-three pairs of chromosomes. Both parents, mother and father, contribute one half each of all the pairs. The DNA molecule itself resembles a double-helix, which looks like a twisting ladder. DNA profiling requires close examination of the DNA's nucleotide bases, which pair up with each other and form the rungs of the ladder. The four bases are adenine (*A*), thymine (*T*), cytosine (*C*), and guanine (*G*). *A* always pairs with *T*, and *C* always pairs with *G*. These pairs can appear in any sequence, for example: AT, AT, GC, TA, CG. Individuals will vary widely in the sequence of these bases, therefore, there will be a vast difference in the genetic makeup of any two people. Such variations in the DNA molecule are referred

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[9] DNA is "responsible for transferring genetic information when cells divide." Gerald Coleman, *Genetic Engineering: Should Parents Be Allowed to Design Their Children?*, 34 How. L.J. 153 (1991). The DNA molecule, itself, was unknowingly discovered by a Swiss chemistry student in 1839. Yet, the quintessence of DNA remained bottled until 1953 when James Watson and Francis Crick began experimentation with the properties of DNA. J. Clay Smith, Jr., *The Genetic Engineering Revolution: A New Century Reality Bibliographic Index (1981-86)*, 32 How. L.J. 61 (1989).

[10] William H. von Oehsen, III., *Regulating Genetic Engineering in an Era of Increased Judicial Deference: A Proper Balance of the Federal Powers*, 40 Admin. L. Rev. 303, 307 n. 22 (1988).

to as '*polymorphisms*.'[11]

The polymorphic zone of the DNA molecule is crucial for DNA analysis. Particularly the polymorphic zone is employed by the FBI, and other commercial laboratories,[12] for a type of analysis called Restriction Fragment Length Polymorphism ("RFLP"). Another technique of analysis called "allele-specific probe analysis" utilizes alleles which are alternate forms of genes.

RFLP analysis permits scientists to recognize and differentiate polymorphic regions of DNA by their length, which is also referred to as band size. The RFLP analysis is comprised of eight steps:[13] 1) extraction, 2) fragmentation by restriction enzymes, 3) gel electrophoresis, 4) Southern blotting, 5) hybridization, 6) autoradiography, 7) interpretation, 8) conversion

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[11] U.S. v. Porter, 618 A.2d 629, 632 (D.C.App. 1992).

[12] Lifecodes Corporation and Cellmark Diagnostics are two such commercial corporations that engage in DNA profiling for forensic analysis. Janet C. Hoeffel, *The Dark Side of DNA Profiling: Unreliable Scientific Evidence Meets the Criminal Defendant*, 42 Stan. L. Rev. 465, 471 (1990). Specifically, in 1991 Cellmark began a program to test the proficiency of forensic labs that utilize DNA analysis. The company formulated the program in response to industry guidelines set out by the Office of Technology Assessment for the purpose of ensuring the quality standards of DNA labs. *Cellmark to Test DNA Analysis Labs*, Wash. Post Bus., April 29, 1991, at 7.

[13] There exist discrepancies among the exact number and name of the several elements of RFLP analysis. For example, usually the first seven steps are recorded, yet Janet C. Hoeffel's article, *The Dark Side of DNA Profiling: Unreliable Scientific Evidence Meets the Criminal Defendant*, 42 Stan. L. Rev. 465, 474 (1990), lists an additional step known as **conversion into a statistical probability.** Additionally, the element *Southern Blotting* in Hoeffel's article is also referred to as *Southern Transfer*.

into a statistical probability.

Extraction is simply the means by which DNA is extracted from a specimen, like blood, semen or skin. The DNA is "washed" from a surface such as clothing then treated with a particular chemical that releases the DNA from the cells.

Fragmentation by restriction enzymes is the process whereby the DNA chain is cut into smaller fragments by a restriction enzyme. A restriction enzyme will recognize a base sequence from four to eight bases long and will consistently propagate the same number and length fragments of DNA in a given individual. Polymorphism comes back into play here "[b]ecause the polymorphic segments differ markedly from one individual to the next."[14] Therefore, the length of the fragments embodying these DNA portions is also prone to differ among individuals.[15]

Gel electrophoresis is where the extracted DNA fragments are applied to a slab of gel and the fragments are moved and sorted in the gel by way of an electrical current. The rate of speed by which a given fragment moves is determined by the fragment's size. For example, the smaller the fragment the faster it will progress through the gel. Thus, larger fragments tend to migrate toward the near end of the gel slab while the smaller fragments migrate toward the far end of the slab.

Southern blotting, or **Southern transfer**, transfers the DNA

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[14] William C. Thompson & Simon Ford, *DNA Typing: Acceptance and Weight of The New Genetic Identification Tests*, 75 Va. L. Rev. 45, 67 (1989).

[15] *Id.* at 68.

fragments from the gel and positions them on a nylon membrane. The fragments assume the same position on the membrane as they appeared in the gel.

Hybridization utilizes radioactive DNA "probes" to locate the most polymorphic site on the DNA fragments because, again, the polymorphic sites are those that are going to distinguish one individual from another. The probe, a single-stranded section of DNA manufactured by genetic engineers, is designed to complement a single-stranded base sequence that appears in or adjacent to the polymorphic site. The probe will seek out and bind only to a specific complementary DNA sequence within the fragments. Excess DNA probes are cleansed away.

Autoradiography makes the otherwise invisible probe-marked bands visible by way of an x-ray film. Specifically, the radioactive content of the probe exposes the film and the band shows up on film. Thus, the fragment is able to appear because of the probe banding to the fragment. This banding is known as "DNA Fingerprinting."[16]

The next step in the process is **interpretation** which means that the bands furnished by a victim's or suspect's DNA is compared with the sample of the DNA bands extracted from the crime scene.

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[16] Although the process has "most commonly referred to as DNA Fingerprinting, the process has also been called DNA typing, DNA profiling, and DNA printing. The term 'DNA Fingerprinting' was coined by Dr. Alec Jeffreys, professor of genetics at the University of Leicester, England, in his seminal article describing how genetic analysis of DNA fragments can yield a individual-specific DNA 'fingerprint.'" Sally E. Renskers, *Trial by Certainty: Implications of Genetic "DNA Fingerprints,"* 39 Emory L.J. 309 n. 3 (1990).

If the patterns match it is very likely that the suspect will be charged with the crime. In most cases, DNA prints are merely visibly compared to determine whether there is a match. Yet, the comparison can also be achieved through the use of machines. Computers read DNA prints and adjust each print into numerical codes which can then be compared with other prints to determine the degree to which two prints match. Moreover, "the use of numerical codes makes possible the creation of large computerized data bases of DNA prints which can be searched to find a match for a given specimen."[17]

Finally, in the step of **conversion into a statistical probability** an examiner will take the match and evaluate the frequency by which a particular DNA profile occurs. This statistic is found out "[b]y consulting a database of results obtained by using the same probe on many individuals."[18] It will be illustrated later how this database can lead to serious implications in the future.

Though these processes seem on their face to be painstaking and somewhat infallible, the truth of the matter is that they are not. Current procedures for DNA profiling have proved unreliable by a legal and scientific standard. Initially, the legal community

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[17] William C. Thompson & Simon Ford, *DNA Typing: Acceptance and Weight of the New Genetic Identification Tests*, 75 Va. L. Rev. 45, 75 (1989).

[18] Janet C. Hoeffel, *The Dark Side of DNA Profiling: Unreliable Scientific Evidence Meets the Criminal Defendant*, 42 Stan. L. Rev. 465, 474 (1990).

was awed by the scientific certainty provided by the profile, however, such confidence in this process is more a matter of perspective than a well founded reality. For this reason, the negative implications of DNA profiling need to be given substantial credence.

The standard for admitting forensic evidence is based upon three major criteria: 1) the technique must be validated as sound by the scientific community; 2) the techniques must be known to be reliable; and finally 3) the technique must be shown to have been applied correctly in a particular case.[19] For the admittance of scientific evidence, the courts have, and still do, rely upon the standard set out in Frye v. United States.[20] The Frye

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[19] Peter J. Neufeld & Neville Colman, *When Science Takes the Witness Stand*, Sci. Am., May 1990, at 48.

[20] 293 F. 1013 (D.C. Cir.1923). *Frye* continues to be the standard used to determine the admissability of scientific evidence. For example, the D.C. Circuit which set forth the *Frye* standard continues to use it. In U.S. v. Shorter, 809 F.2d 54, 59 (D.C.Cir. 1987), the court acknowledged its use of *Frye* and looks at other circuits that follow the *Frye* standard as well. *See, e.g.*, United States v. McDaniel, 538 F.2d 408, 412-13 (D.C. Cir. 1976) where the admissability of voice print spectrography was examined. *See also* United States v. Stifel, 433 F.2d 431, 438 (6th Cir. 1970), which scrutinized neutron activation analysis.

However, *Frye* has, likewise, been criticized. In U.S. v. Downing, 753 F.2d 1224, 1232 (1985), the third circuit rejected the *Frye* standard for its policy conflict with Rule 702 of the Federal Rules of Evidence. Instead, the court "set forth an alternative standard for evaluating novel scientific evidence that...comport[ed] with the language and policy of Rule 702." In Downing, the court appears to determine that Rule 702 standards call for the liberal admissability of evidence, if it is 'helpful' to the jury in reaching an informed decision...." *Id.* at 1229, 1230, citing State v. Chappel, 135 Ariz. 281, 660 P.2d 1208 (1983). The policy conflict in these cases is with Rule 403 of the Federal Rules of Evidence which provides that "although relevant, evidence may be excluded if its probative value is substantially outweighed...by considerations of undue delay, waste of time,

court[21] established the standard for the admissability of scientific evidence into the courtroom. A major element of admissability of a given scientific technique is the general acceptability of the technique by the scientific community.

The Challenge of Scientific Acceptability and the Need for Legal Scrutiny

The difficulty with the use of the Frye rule has been one of interpretation. In other words, scientists, judges, lawyers and legal scholars argue about how to define general acceptance of a scientific technique and how to exercise that technique equitably and without undue prejudice. Yet, there are strong proponents for the admissability of DNA typing who tend to discount the policy debate and seek a majority consensus for DNA profiling from the scientific community.[22]

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needless presentation of cumulative evidence." *See generally* J. Clay Smith, Jr. and Stephen T. Phelps, *District of Columbia Annotation to the Proposed Federal Rules of Evidence*, 32 Fed. B. J. 270, 289 (1973), quoting U.S. v. Kearney, 420 F.2d 170, 174 (D.C. Cir. 1969)("All rules as to admissibility of evidence are subject to supervening consideration that seek to avoid danger of undue prejudice....").

[21] The *Frye* case excluded evidence from a procedure known as the systolic blood pressure deception test, a prototype of the polygraph, on the grounds that the test did not exhibit widespread recognition among the physiological and psychological authorities of the time. The court established that for a particular scientific procedure to be admissible as evidence in a court of law the procedure must be generally accepted in the scientific community. *Frye* at 1014.

[22] *The New York Times* reported that "law enforcement authorities are less interested in academic debate over uncertainties or limits to knowledge, and highly interested in achieving the uniform consensus that would make DNA typing broadly

There is also a debate over whether this test should apply only to general scientific research or whether it should be extended to encompass forensic science.[23] Scientists agree that in an area, such as forensics, a particular technique "must be tested thoroughly to ensure an empirical understanding of the technique's usefulness and limitations."[24] This is truly essential given the reality that someone's future rests in the balance of an inaccurate DNA result. One scholar suggests that "before results of the DNA typing technique can be accepted as scientifically reliable in forensics,[25] the following controls and

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admissible in court." Gina Kolata, *DNA Fingerprinting: Built-In Conflict*, N.Y. Times, April 17, 1992, at A13.

[23] Forensic science came about in the early twentieth century "in response to rising fears of urban crime." To ensure criminal convictions, city prosecutors relied upon science to aid in the investigative process. The historical hub of forensic science was the coroner's office where law, medicine and politics intermixed. "The coroner's office was the first official stop in the designation, prosecution, and punishment of crime, and the confrontation among the three professions over control of the office and its work was a product of early-twentieth-century industrial metropolitan culture. Julie Ann Johnson, *Speaking for the Dead: Forensic Scientists and American Justice in the Twentieth Century*, 53 Dissertation Abstracts Int'l 2516 (1992).

[24] Peter J. Neufeld & Neville Colman, *When Science Takes the Witness Stand*, Sci. Am., May 1990, at 49.

[25] The American Bar Association Journal reported that a 200 page report was released by the National Academy of Sciences' National Research Council in April 1992 that supported the general use of DNA evidence, however, the report simultaneously questioned the reliability of the forensic labs that test the samples as well as the statistical methods used by these labs. Don J. DeBenedictis, *DNA Report Raises Concerns*, 78 A.B.A.J. 20 (July 1992).

Moreover, the report cautioned courts to terminate the admission of DNA evidence "until laboratory standards have been tightened and the technique has been established on a stronger scientific basis." Though the report believed forensic testing to be legitimate in theory, it added that "the method is potentially

standards must be developed: 1) controls to ensure the accurate interpretation of results; 2) standard for declaring matches; 3) standards for the choice and number of polymorphic sites studied; 4) standards for determining the probability of a coincidental match and for determining the relevant population studies; 5) standards for record keeping; and 6) standards for proficiency testing and licensing."[26]

Indeed, it is likewise crucial that the legal environment have a firm grasp of the scientific technique as well so that it can properly evaluate the technique and its accuracy. So often, lawyers, judges, as well as the jury, look to the credentials of the scientific expert witness[27] to validate scientific procedures instead of being more familiar with the procedures themselves.

In a publication examining the threatening abuses of

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too powerful and too important for its development and use to be left solely in the hands of prosecutors and law-enforcement officials. Instead, the report says it must be regulated and controlled by scientists and Federal agencies that have no stake in the method's success or failure." *U.S. Panel Seeking Restriction on Use of DNA in Courts*, N.Y. Times, April 14, 1992.

[26] Janet C. Hoeffel, *The Dark Side of DNA Profiling: Unreliable Scientific Evidence Meets the Criminal Defendant*, 42 Stan. L. Rev. 465, 479 (1990).

[27] In U.S. v. Yee, 134 F.R.D. 161 (N.D.Ohio 1991), defense attorneys debated with prosecutors over the reliability of the expert scientific testimony of two prominent scientists. Specifically, the defense attorneys accused the scientists of misrepresentation of themselves and their work. Defense attorneys further asserted that the government was improperly and illegally attempting to suppress any scientific criticism of DNA profiling. The accusations were met with bitter response from the prosecution and the accused doctors. Rorie Sherman, *DNA is on Trial Again*, 14 Nat'l L.J. 16, March 16, 1992.

biological information,[28] two scholars concluded that "lawyers must develop strategies to prepare for future litigation in which they will need to defend against encroachments on legal rights."[29] A group of scholars propose a three-step process for advocates to achieve such effectiveness in their representation: counsel should be familiar with the technological procedures, at least on an elementary level; the procedure should be examined critically for any potential abuse; and the word of the scientific community should not be taken at face value, but questioned thoroughly.[30]

DNA Profiling and Biological Approaches to Crime

There has been a move recently, by some, to link violent behavior to genetic makeup or race. This topic was due to be an issue at a 1992 University of Maryland Conference entitled "Genetic Factors in Crime: Findings, Uses and Implications," funded by the National Institute of Health ("NIH") but was canceled due to the ensuing controversy that resulted. The university saw this conference as an opportunity for academic exchange on a possible correlation between race and crime, a view that fell suspect to critics of the conference. These critics argued that the implications of such a biological approach to crime would be used

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[28] Dorothy Nelkin & Laurence Tancredi, **Dangerous Diagnostics: The Social Power of Biological Information** (1989).

[29] Jennifer Dufault, Book Note, 25 Harv. C.R.-C.L. Rev. 241 (1990) (reviewing Dorothy Nelkin & Laurence Tancredi, **Dangerous Diagnostics: The Social Power of Biological Information** (1989)).

[30] *Ibid.*

to justify blanket labeling of the black race.

Peter Breggin, a psychiatrist, warned "that a biological approach to research into criminality would lead to the use of therapeutic drugs to control the behavior of inner city children."[31] Breggin likened such genetic study to those done in Nazi Germany[32] and he also made the point that "[b]iological approaches ignore the sociological factors, such as poverty, that contribute to the development of violent behavior."[33] Breggin's assertions were not far fetched considering the derogatory comments of Frederick K. Goodwin, former head of the Alcohol, Drug Abuse and Mental Health Administration and proponent of the "violence initiative," who likened the behavior of inner-city males to "monkeys in the jungle."[34] The violence initiative, which is not

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[31] Lynne Duke, *Controversy Flares Over Crime, Heredity*, Wash. Post, Aug. 29, 1992, at A4.

[32] In Nazi Germany, experiments were conducted on Jewish, Russian, and Polish prisoners. These experiments were even the subject of lectures at medical conferences attended by doctors who came from other countries. However, "records show that the doctors sat through medical reports of the infliction of horrible injuries on these *'lesser races'* and then proceeded to discuss the medical lessons to be learned from them without anyone making even a mild protest." Elizabeth Mensch & Alan Freeman, *The Politics of Virtue: Animals, Theology, and Abortion*, 25 Ga. L. Rev. 923, 943 n. 38 (1991)(emphasis added).

[33] Lynne Duke, *Controversy Flares Over Crime, Heredity*, Wash. Post, Aug. 29, 1992, at A4.

[34] In fact it was because of Goodwin's comments that he was removed from his position at the ADAMHA. Goodwin also made a speech February 25, 1992 indicating that conduct disorders likely to lead to violent behavior could be detected in children as early as the age of four. Though Goodwin apologized for the "monkey in the jungle" statement, African American groups, such as the Committee to Stop the Violence Initiative and the NAACP, used his statement as evidence that the conference was a study on blacks.

yet approved, would encompass environmental, developmental and genetic perspectives of violent behavior incorporating human and animal studies. George Buntin, Jr., executive director of the Baltimore branch of the NAACP, summed up the critics' sentiments of the violence initiative conference, stating:

> We're concerned that there is a move on the part of some people to relate crime to the African-American community, and to say there are ingrained or genetic reasons why we are more prone to crime than others....
>
> People used to say there are genetic reasons why African-Americans are not as literate as European Americans, and it's hogwash. For the University of Maryland to host a conference, sponsored by federal funds, to even discuss this is giving those who promulgate that research a sense of legitimacy that they don't deserve.[35]

Howard University President Franklyn G. Jennifer also expressed relief that the National Institute of Health had withheld support of research designed to draw correlation between race, genetics and violent behavior[36] because he, like other concerned citizens, realize that "much of the data on genetically based health differences by race is highly ambiguous,"[37] and even more

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Lynne Duke, *Controversy Flares Over Crime, Heredity*, Wash. Post, Aug. 29, 1992, at A4.

[35] Charles Babington, *U-Md. Cancels Conference on Genetic Link to Crime*, Wash. Post, Sept. 5, 1992, at 1. The Stigmatization of groups is real. Elaine Draper, **Risky Business** 51-52 (1991).

[36] In a October 1992 letter to Derrick Humphries, Jennifer stated, "Our concerns about recent controversies surrounding DHHS [Department of Health and Humans Services] research activities were considerably eased when we heard Secretary [Louis] Sullivan pledge that the National Institute of Health would not support research which links race, or genetics, with violent behavior."

[37] Elaine Draper, **Risky Business** 88 (1991).

so on the question of race and violence.[38]

Fourth Amendment Implications of DNA Profiling

Aside from the legal and scientific scrutiny of the procedure, DNA testing definitely has the potential to violate the fourth amendment and privacy rights of all individuals in the not too distant future. The Fourth Amendment of the Constitution protects U.S. citizens from "unreasonable searches and seizures" and the issue of warrants without probable cause.[39] Due to the fact that a tissue sample involuntarily taken from a suspect could give a positive identification, the court "may be tempted to stretch the exceptions to the fourth amendment's requirement that a warrant

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[38] It should be noted that in 1983 the President's Commission for the Study of Ethical Problems in Medicine and Biomedical and Behavior Research cautioned NIH that the "time has now come to broaden [genetic engineering] under scrutiny to include issues raised by the intended uses...It would also be desirable for this 'next generation' RAC to be independent of Federal funding bodies such as NIH...[the report recommended as oversight body] The need for an appropriate oversight body is based upon the profound nature of the implications of gene splicing..." The report then refers to hearings held by Senator Albert Gore, Jr., before The Investigations and Oversight Subcommittee of the House Science and Technology Committee, held on November 16-18, 1982. **Summing Up: The Ethical and Legal Problems in Medicine and Biomedical and Behavioral Research** 42-43 (1983).

[39] The Fourth Amendment of the Constitution provides:

> The right of the people to be secure in their persons, houses, papers, and effects, against unreasonable searches and seizures, shall not be violated, and no Warrants shall issue, but upon probable cause, supported by Oath or affirmation, and particularly describing the place to be searched, and the persons or things to be seized.

based on probable cause precede a search."[40] The potential probative value of DNA profiling evidence makes it especially vulnerable to abuse. That abuse can plausibly lead to heightened discrimination and undermine fourth amendment and privacy rights for the suspect as well as the entire populace.

State and federal courts vary on what constitutes an illegal search and seizure once a suspect is taken into custody. For example, in State v. Sharpe[41] the court held that it was not violative of the suspect's rights to pluck his hair for genetic testing because the hairs were visible and the suspect was being arrested. Yet federal courts are unresolved on whether the same circumstances constitute a defendant's fourth amendment rights.[42]

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[40] Janet C. Hoeffel, *The Dark Side of DNA Profiling: Unreliable Scientific Evidence Meets the Criminal Defendant*, 42 Stan. L. Rev. 465, 527 (1990).

[41] 284 N.C. 157, 200 S.E.2d 44 (1973). In State v. Payne, 328 N.C. 377, 402 S.E.2d 582, 594 (1991), the defendant argued that seizure of samples of his head and pubic hair was unconstitutional because it was an unreasonable intrusion of his privacy. Yet, the court followed *Sharpe* and held that such a seizure was reasonable and was not a violation of the defendant's constitutional rights. Likewise, in State v. Downes, 57 N.C.App. 102, 291 S.E.2d 186, 188 (1982), the court stated "[t]he seizure of hair samples from a defendant without a warrant after a lawful arrest is not an unreasonable seizure since it is a minor intrusion into and upon an individual's person."

[42] *Compare* In re Grand Jury Proceedings (Mills), 686 F.2d 135, 137-40 (3rd Cir.) (involuntary taking of facial and scalp hair is not a search or seizure), *cert. denied*, 459 U.S. 1020 (1982) *and* United States v. Weir, 657 F.2d 1005, 1007 (8th Cir. 1981) (plucking hair is a search and seizure but does not implicate the fourth amendment because of minimal intrusion) *with* Bouse v. Bussey, 573 F.2d 548, 550 (9th Cir. 1977) (warrantless plucking of pubic hair violates the fourth amendment.) *See* Sally E. Renskers, *Trial by Certainty: Implications of Genetic "DNA Fingerprints"*, 39 Emory L.J. 309, 327 n. 125 (1990).

The legitimacy of the identification procedures is determined by "balancing the public interest in effective law enforcement against the private interest in freedom from governmental intrusion."[43] However, if governmental interference were to go completely unchallenged by those who take all ramifications of DNA testing into account, the "[p]ublic interest in law enforcement [could] increasingly prevail over private interests in privacy and freedom from governmental intrusion."[44]

The Privacy Dilemma

With the imminent operation of a criminal DNA database on the horizon,[45] the privacy rights of all individuals could hang in the balance. In other words, how far behind are the prospects of a national database for all citizens if a national criminal database exists. A national database could conceivably incorporate a DNA profile of every citizen. The possibilities, uses and consequences of such public record keeping are endless, including the risks of

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[43] *Id.* at 327.

[44] *Id.* at 324.

[45] Eighteen states have authorized DNA databases within the last two years yet none were completely operational as of early May 1992. These genetic databases are created "by compelling convicted murderers and sex offenders to provide blood samples." Selwyn Raab, *Cuomo Seeks Genetic Data of Offenders*, N.Y. Times, May 10, 1992, at 27. Governor Mario M. Cuomo would like to establish a criminal database in New York, yet civil liberty proponents and defense groups are against a database until scientific reliability is secured. These critics also argue that the rights of individuals would be violated if the individuals were compelled to give blood samples as evidence that could be used against them in the future. *Ibid.*

political abuse.[46] Not only could law enforcement personnel have access to such information, but this same information could be available to employers, banks, insurance companies, adoption agencies, educational institutions and so on for prefatory and discriminatory purposes. Genetic databases pose real national security implications if private information about citizens fell into the hands of unfriendly foreign public or private concerns.

Genetic screening of individuals and ethnic groups is nothing new.[47] In the recent past genetic screening has been used as a tool to discriminate against ethnic groups. For example, certain states enacted laws in the early 1970s to identify carriers of sickle cell anemia and to warn against the propagation of children that could potentially carry the gene. Particularly since blacks were the primary carriers of the gene, "'genetic discrimination' quickly turned into racial discrimination when unfounded fears of

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[46] For a review of historical concerns about political uses of the law, *see* Haywood Burns, *Political Uses of the Law*, 17 How. L.J. 760, 761, 769 (1973); Marsha A. Quintana, *The Erosion of the Fourth Amendment Exclusionary Rule*, 17 How. L.J. 805, 820 (1973).

[47] The eugenics movement of the 1920's sought to sterilize those who were labeled "social undesirables" or those who were viewed to be dependent upon the state. Janet C. Hoeffel, *The Dark Side of DNA Profiling: Unreliable Scientific Evidence Meets the Criminal Defendant*, 42 Stan. L. Rev. 465, 534 (1990). Eugenicists of the late nineteenth and twentieth centuries also thought that economic and social status among the races were apart of the genetic makeup of the race. In other words, eugenicists used the scientific technology of their day to sanction their prejudice against those who were thought to be inferior because of race, mental competency, criminal record, national origin, and/or economic status. Jennifer Dufault, Book Note, 25 Harv. C.R.-C.L. Rev. 241, 247 (1990) (reviewing Dorothy Nelkin & Laurence Tancredi, **Dangerous Diagnostics: The Social Power of Biological Information** 11 (1989)).

the disease led to decreased employment opportunities as well as higher insurance premiums for blacks."[48]

Unfortunately, genetic technology continues to play a role in the workplace to the point where it could create "new minorities."[49] New minorities, and the historical "old racial minorities" are comprised of those individuals who manifest "deficient" DNA profiles according to their DNA diagnostic tests. Such individuals stand to be denied employment, promotions, insurance and disability coverage because their profiles exhibit evidence that they could carry a gene of a debilitating, or even fatal, disease. Yet, there is a difference between simply carrying a gene and actually having a disease. Interestingly enough, "[g]enetic screening can detect who carries the gene, but not who will ultimately exhibit symptoms and experience illness."[50]

Nevertheless, from an employer's point of view such a person could conceivably pose a financial risk in training, workmen's compensation and insurance premiums, and so forth. As a result, many civil rights violations can occur and law to remedy such discriminatory private conduct is limited.

The variety and profundity of precarious implications that are

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[48] Janet C. Hoeffel, *The Dark Side of DNA Profiling: Unreliable Scientific Evidence Meets the Criminal Defendant*, 42 Stan. L. Rev. 465, 534-35 (1990).

[49] Jennifer Dufault, Book Note, 25 Harv. C.R.-C.L. Rev. 241, 245 (1990) (reviewing Dorothy Nelkin & Laurence Tancredi, **Dangerous Diagnostics: The Social Power of Biological Information** (1989)). *See* Elaine Draper, **Risky Business** 83-98 (1991), deals with genetic screening and stratification by race.

[50] *Id.* at 248.

staring us back in the face as we become more technologically sophisticated is staggering, an implication about which groups such as African-Americans are well aware.[51] Let us hope and work toward the goal that such sophistication does not make us primitive in the way that we treat ethnic groups and the disadvantaged. As we venture into the twenty-first century we must temper excitement over biological advancement with the vision that new discoveries, while they may be beneficial, they also have the built-in propensity for perversion and exploitation to the detriment of all.[52]

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[51] For parallel areas of technology and privacy concerns confronting African Americans, *see* Kenneth S. Tollett, *Bugs in the Driving Dream: The Technocratic War Against Privacy*, 17 How. L.J. 775, 777 (1973).

[52] It bears repeating that "science is a reverent discipline, but it cannot and must not be left unnoticed or unscrutinized when it involves such great political, social, moral, and legal issues as those associated with genetic engineering." J. Clay Smith, Jr., The Genetic Engineering Revolution: A New Century Reality Bibliographic Index (1981-86), 32 How. L.J. 61, 62 (1989).