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DNA Data Banking: The Dangerous Erosion of Privacy

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DNA DATA BANKING: THE DANGEROUS EROSION OF PRIVACY

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I. DNA PROFILING: THE SCIENCE

DNA profiling, also termed DNA fingerprinting or DNA typing, allows examination of human biological material at its most fundamental natural level: the deoxyribonucleic acid molecule ("DNA").³ All nucleated

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³ "The structure of DNA: a molecule of human DNA is a double helix consisting of two nucleic acid strands, each of which contains a sugar backbone (the deoxyribose) and attached bases: cytosine (C), guanine (G), adenine (A), and thymine (T)." Silverman, *DNA Analysis in the Detection of Genetic Diseases*, 4 NEW DEV. SCI. 69, 70 (1989). The phenomenon of the sequence of base pairs (bonding between base pairs, also called nucleotides, occurs naturally on opposite DNA strands; A bonds with T and G bonds with C) in a single strand of DNA matching a precise sequence of base pairs in its opposing strand is known as "complementary base pairing." Weedn, *DNA Profiling*, 1 EXPERT EVID. REP. 61, 62 (1989). The 23 pairs of chromosomes in each human cell are comprised of sequences of these DNA base pairs or nucleotides. One member of the pair of 23 chromosomes is inherited from one's mother, and the other member of the pair is inherited from one's father. *Id.* Humans have thousands of genes located on the 46 chromosomes. A gene is a particular sequence of nucleotides or base pairs that "codes for a particular structure, function or feature, such as the gene for brown hair" or brown eyes, and alternate forms of genes are called alleles (e.g. blue or green eyed allele). Note, *The Dark Side of DNA Profiling: Unreliable Scientific Evidence Meets the*

cells contain DNA.⁴ Mature red blood cells, which do not contain nuclei, are a significant exception.⁵ DNA is bound in molecules of double helical chains.⁶ It holds an individual's unique genetic code or profile.⁷ This genetic code contains the past history and thus dictates the future of an individual's racial and genealogical makeup and influences an individual's medical and psychological makeup.⁸

Research scientists have developed techniques by which particular characteristics of an individual can be identified by this DNA blueprint or profile.⁹ Through the use of these biochemical procedures,¹⁰ developed

Criminal Defendant, 42 STAN. L. REV. 465, 470 (1990). Genes are the fundamental units of heredity, and the total pool of genetic information is called the human genome. *People v. Castro*, 144 Misc.2d 956, 962, 545 N.Y.S.2d 985, 989 (1989). See also, Lander, *DNA Fingerprinting on Trial*, 339 NATURE 501 (1989); Moody, *DNA Analysis in Forensic Science*, 39 BIOSCIENCE 31 (1989); Strauss, *DNA Fingerprinting*, 91 TECHNOLOGY REV. 8 (1988); Kelly, Rankin, and Wink, *Method and Applications of DNA Fingerprinting: A Guide for the Non-Scientist*, 73-152 CRIM. L. REV. 105 (1987).

⁴ DNA is contained in sperm, nucleated blood cells, cells from the roots of hair, and cells from soft tissue. D. DiMAIO, *FORENSIC PATHOLOGY* 399-403 (1989).

⁵ *People v. Castro*, 144 Misc.2d 956, —, 545 N.Y.S.2d 985, 988 (1989); Note, *The Dark Side of DNA Profiling: Unreliable Scientific Evidence Meets the Criminal Defendant*, 42 STAN. L. REV. 465, 469 n.20 (1990).

⁶ *DNA Fingerprinting*, Boston Globe, Feb. 25, 1990, (Magazine), at 43. DNA is a double stranded molecule, the double helix, which looks like a three foot long spiral staircase. Lewis, *DNA Fingerprints Witness for the Prosecution*, DISCOVER, Jan. 1988, 44, 47.

⁷ The technique first and most commonly used to construct a DNA profile is restriction fragment length polymorphism analysis, ("RFLP"). Weedn, *DNA Profiling*, 1 EXPERT EVID. REP. 61, 66 (1989). In the United States, forensic RFLP testing has been pioneered by two private laboratories, Lifecodes Corporation of Valhalla, New York, and Cellmark Diagnostics of Maryland. *DNA Detectives*, N.Y. Times, Nov. 6, 1988, (Magazine), at 70.

⁸ Note, *supra* note 3, at 531. See Merz, *Geneticists Ponder Ethical Implications of Screening*, 254 J. A.M.A. 3160 (1985); Motulsky, *Medical Genetics*, 261 J. A.M.A. 2855-56 (1989); See *infra* notes 43, 50 and accompanying text.

⁹ Forensic science has adopted these scientific techniques for the purpose of identifying the individual origin of trace semen, blood or saliva samples left at the location of a crime. Of the three billion nucleotidase which are inherited from each parent, about 1 in 1,000 is a site of variation, or polymorphism in the population. Lander, *DNA Fingerprinting On Trial*, 339 NATURE 501 (1989). These variations or polymorphisms occur in different areas of the DNA. Polymorphisms are the basis of DNA identification. *People v. Castro*, 144 Misc.2d 956, —, 545 N.Y.S.2d 985, 988 (1989).

¹⁰ The discovery of a new method enabled detection of DNA differences between people.

This procedure involved isolating DNA from any cell nucleus, cleaving it, separating the cleaved fragments electrophoretically by size in agarose gels, transferring the sized fragments to a solid membrane and then applying radiolabelled DNA probes to the membrane. This procedure is now commonly referred to as the Southern blot technique.

Hegele, *Molecular Forensics: Applications, Implications and Limitations*, 141 C.A.M.J. 668, 669 (1989). This procedure has made genetic and forensic analysis practical.

originally in medical research of inherited diseases with far different objectives,¹¹ it was later discovered by Dr. Alec Jeffreys, a geneticist at the University of Leicester in England, that forensic science could use restriction fragment length polymorphism analysis ("RFLP"s) to identify the individual origin of biologic evidence such as blood or semen based on their distinctive RFLP patterns.¹² Dr. Jeffreys had been searching for genetic variations to serve as "markers" for inherited disease when he discovered that the techniques molecular biologists use to visualize variations in DNA could also be used to establish identity.¹³ Thus was established the forensic tool of DNA identification.¹⁴

Everyone's DNA, with the exception of identical twins, has unique variations that can be used to establish identity.¹⁵ DNA profiling is a method that utilizes deoxyribonucleic acid (DNA) to identify the derivation of trace biologic evidence such as blood, semen, saliva, urine, hair (with root shaft attached) or skin.¹⁶ Therefore, forensic DNA profiling

¹¹ DNA probe analysis is derived from basic genetic research with far different aims. N.Y. Times, Nov. 6, 1988, (Magazine), at 71. By using RFLPs to track the inheritance of chromosomal regions in families afflicted with genetic disorders, a serendipitous gift to police science, DNA profiling was discovered. Lander, *supra* note 3, at 501. Scientists use a technique that forms this genetic material into a distinctive pattern, similar to bar codes on retail merchandise. Clark, *Crimes Misdemeanors and Molecules*, THE NEW MD MAG., Mar. 1990 at 41, 42.

¹² DNA Fingerprinting for forensic purposes was developed by British geneticist Alec Jeffreys, PhD, in 1985. Dr. Jeffreys is a Lister Institute Research Fellow and a professor of genetics at the University of Leicester. Jeffreys, Wilson, & Thein, *Individual-Specific Fingerprints of Human DNA*, 316 NATURE 76-79 (1985); Gill, Jeffreys, & Werret, *Forensic Applications of DNA Fingerprints*, 318 NATURE 577-79 (1985). DNA Fingerprinting is marketed in the United States by Cellmark Diagnostics, a subsidiary of ICI Americas, Inc., the British firm that has licensed Dr. Jeffrey's technology. Merz, *DNA Fingerprints Come to Court*, 259 J. A.M.A. 2193 (1988).

¹³ Merz, *DNA Fingerprints Come to Court*, 259 J. A.M.A. 2193-94 (1988); Lewis, *supra* note 6, at 47.

¹⁴ Scientists compare a suspect's unique genetic material with DNA samples taken from body fluids or a trace amount of skin, hair or blood found at the scene of the crime. *DNA Fingerprinting Called Privacy Threat*, Wall St. J., Feb. 6, 1990, at B1. Scientists can discriminate between various people's DNA by examining several of the 3 million polymorphic sites (sites of variation). "By examining the sizes of a sufficient number of fragments at different sites on different chromosomes, statistical procedures permit enough discrimination to establish the unique configuration of any one person's DNA pattern." *People v. Castro*, 144 Misc.2d 956, ___, 545 N.Y.S.2d 985, 989 (1989). The calculation of this probability is based on population frequency data and analyzed by using statistical concepts from population genetics. Weedn, *supra* note 3, at 66. For a discussion of the common DNA profiling procedures see Weedn, 1 EXPERT EVID. REP. 61 (1989).

¹⁵ *The Case of the Unraveling DNA*, DISCOVER, Jan. 1990, 46; Since identical twins are both the product of a single union between one egg and one sperm cell, the DNA of the twins is identical. *Castro*, 545 N.Y.S.2d at 988 n.1.

¹⁶ Weedn, *supra* note 3, at 61. Since DNA profiling was first admitted as evidence in U.S. courts in 1987, the technique has jolted the criminal justice community and has been heralded by one New York County Court Judge, Judge Harris, as "the single greatest advance in the goal of convicting the guilty and acquitting the innocent since the advent of cross-examination." Clark, *supra* note 11, at 41. See also *People v. Wesley*, 140 Misc. 2d 306, 533 N.Y.S.2d 643 (1988).

evidence has been used in criminal cases for such purposes as identifying the remains of a victim,¹⁷ linking a suspect to a crime,¹⁸ and exculpating a falsely accused suspect.¹⁹

¹⁷ In Pennsylvania the remains of a murdered nursing home patient were identified through the use of DNA forensic evidence. *N.Y. Times*, Nov. 6, 1988, (Magazine), at 88.

¹⁸ In November of 1987 Tommie Lee Andrews became the first person in the United States to be convicted on the basis of DNA profiling evidence. The Andrews case also produced the first appellate decision to uphold the admissibility of forensic DNA evidence in a criminal case. *Andrews v. State*, 533 So.2d 841 (Fla. Dist. Ct. App. 1988). A Maryland appellate court upheld the introduction of DNA evidence in another sexual assault case. *Cobey v. State*, 80 Md.App. 31, 559 A.2d 391 (1989), *cert. denied*, 317 Md. 542, 565 A.2d 670 (1989). In Pierce County, Washington, Alan J. Haynes, a bus driver was convicted of raping one of his passengers (the victim was afflicted with Alzheimer Disease and could not identify her attacker) through the use of DNA evidence. *N.Y. Times*, Nov. 6, 1988, (Magazine), at 70. In Daytona Beach, Florida DNA evidence was used in the successful murder prosecution of Randall Scott Jones. Jones was sentenced to the electric chair. *Id.* at 71. In New York the so-called "Forest Hills rapist" was convicted on an 18 count indictment through the use of forensic DNA evidence. *Id.* The Virginia Supreme Court became the first state high court to uphold a criminal conviction based on DNA profiling evidence in a rape-murder case where the defendant was sentenced to death. *Spencer v. Commonwealth*, 238 Va. 275, 384 S.E.2d 775 (1989), *cert. denied*, 110 S. Ct. 1171 (1990) [Spencer I] and *Spencer v. Commonwealth*, 238 Va. 295, 384 S.E.2d 785 (1989), *cert. denied*, 110 S. Ct. 759 (1990) [Spencer II]. After comparing seminal fluid stains left at the crime scene with a sample of Mr. Spencer's blood, scientists testified that the odds that anyone other than Mr. Spencer had committed the crimes were one in 135 million in one of the cases and one in 705 million in the other. *Nat'l L. J.*, Oct. 9, 1989, at 6, col. 1. "Prosecutors had little other evidence to connect Mr. Spencer to the 1987 murders." *Id.* The cases the Virginia Supreme Court affirmed were tried well before defense attorneys had made any advances in their challenge to DNA so-called fingerprint evidence. *Id.* These early decisions relied on claims that improper test procedures would yield no result rather than an incorrect result. Levy, *DNA Evidence in Criminal Cases: Legal Developments*, N.Y.L.J., Apr. 25, 1990, at 1, col.1. They fostered a confidence that DNA forensic evidence "posed no significant issues, which vanished with *People v. Castro*, [545 N.Y.S.2d 985 (1989)]." *Id.* at 6, col.3. For the first time a state court judge, in a New York murder case, held that DNA fingerprint evidence could not be admitted because in this particular case Lifecodes Corp. failed to use generally accepted scientific techniques for obtaining reliable results for establishing the frequencies with which matches might occur within a population. *Nat'l L. J.*, Oct. 9, 1989, at 6, col. 1. Since *Castro*, the Minnesota Supreme Court has also refused to admit DNA profiling evidence in *State v. Schwartz*, 447 N.W.2d 422 (Minn. 1989); see *supra* note 8.

¹⁹ In Illinois, it took DNA fingerprint evidence to clear the name of Gary Dotson, sent to prison in 1979 for raping Cathleen Crowell Webb. 75 A.B.A.J. 19 (1989). In a widely publicized case, Ms. Webb publicly declared that she lied when she accused Mr. Dotson of raping her six years earlier. Although Dotson's sentence was commuted, it was not until tests on a semen stain were performed that the charges against him were dropped. Mr. Dotson was freed in 1989. Clark, *supra* note 11, at 42, 43. Contrary to the ill informed belief of some prosecutors, DNA profiling analysis is not determinative in a multiple rape situation. Thus, the failure to create a DNA identification in such a situation creates a presumption and should not be admitted by the prosecution since it tends to confuse the jury. Sullivan, *Semen Tested in Jogger Case Was Not That of Defendants*, *N.Y. Times*, July 14, 1990, at 25, col. 5; *To Eliminate Issue Of Boyfriend*, *Newsday*, July 17, 1990, at 5.

The statistical basis for the probability that two individuals by chance would have matching DNA profiles has been projected by various scientific witnesses with astronomical certainty.²⁰

Recently, the accuracy of these mathematical calculations has been attacked by the forensic scientific community²¹ and the courts.²² The New

²⁰ Some experts who are proponents of DNA typing contend the likelihood of identical DNA patterns emerging from individuals are close to 10 million to 1. Chi. Tribune, Apr. — 1989, at C1. Figures have been provided by two private labs of a coincidental match occurring between two different individuals which reach staggering proportions. *Conviction by Chromosome*, 18 A.B.A. STUDENT LAW, 26, 29 (Dec. 1989). In *Andrews v. State*, 533 So.2d 841 (Fla. Dist. Ct. App. 1988) Lifecodes' Dr. Michael Baird testified that there was a "one in ten billion chance that the match between Andrew's DNA and that of the rapist was a coincidence." *Id.* In Daytona Beach, Florida, Assistant State Attorney, Mac MacLeod used DNA evidence in a successful murder prosecution in which Randall Scott Jones was sentenced to the electric chair. N.Y. Times, Nov. 6, 1988, (Magazine), at 72. In the Jones case Dr. Daniel Garner, a Cellmark representative, testified that the DNA sperm sample matched Jones's DNA. He stated that "there was a one in 9.3 billion chance that the match was a coincidence." 18 A.B.A. STUDENT LAW, 26 (1989).

²¹ There is serious concern among the scientific community regarding the practical application of forensic DNA typing.

[E]xamination of some of the data bases used for forensics reveals that they deviate grossly from Hardy-Weinberg equilibrium; . . . [P]rocedures used to calculate allele frequencies in the data base are inconsistent with the procedures used for declaring a match between forensic samples, with the result that the reported odds of a match may greatly overstate the true probability; . . . [E]ven simple molecular biological controls are routinely omitted from the experiments.

Lander, *Population Genetic Considerations in the Forensic Use of DNA Typing*, 32 BANBURY REPORT: DNA TECHNOLOGY AND FORENSIC SCIENCE 143, 153 (1989). Dr. Lander has recently stated: "There is obviously enough question about DNA [fingerprinting] analysis that the National Academy [of Sciences] has a committee that is attempting to write a report." Kolata, *Justice System Takes a Hard Look at Scientific Evidence*, N.Y. Times, Feb. 24, 1991, at 6, col. 1 [hereinafter Kolata].

Therefore, the "procedures currently being used [in forensic DNA identification] would be considered quite unreliable by the scientific community." *Id.* Some astronomically small probabilities of matching by chance, which have been claimed in forensic applications of DNA profiling, presently lack substantial empirical and theoretical support. Cohen, *DNA Fingerprinting for Forensic Identification: Potential Effects on Data Interpretation of Subpopulation Heterogeneity and Band Number Variability*, 46(2) AM. J. HUM. GENET. 358-68 (1990); see Lander, *supra* note 3, at 504. Kolata, *Some Scientists Doubt the Value of Fingerprint Evidence*, N.Y. Times, Jan. 29, 1990, at A1. Dr. Joel Cohen, a population geneticist and mathematician at Rockefeller University, argues "that there are no data on the patterns in which DNA bands are inherited in a population, which precludes any accurate calculation of odds [the likelihood that two different people, by chance, would have matching DNA profiles]." N.Y. Times, Jan. 29, 1990, at A18. Dr. White, who helped the FBI develop its system, stated that

the odds depend on the population being studied. In a neighborhood whose members come from one small town in Italy, for example, the odds would be quite different that two people would match by chance than they would be if a person chosen from that neighborhood were compared to someone chosen at random from the entire United States.

Id. Dr. Philip Green, a molecular biologist and mathematician at Washington University in St. Louis, stated that "the particular pattern [of DNA bands] in a suspect might be relatively common in a local population, [however the] typical procedures for calculating odds [the likelihood that two different people by chance would have matching DNA profiles] don't take that into account." *Id.*

²² Several recent cases have raised serious doubts about the claims made for DNA evidence. As the court stated in *Commonwealth v. Curin*:

York State Division of Criminal Justice Services issued a report by the New York State Forensic DNA Analysis Panel that declared, "sweeping claims of accuracy, [by private labs] stating that the probability of error is one in a million, or in some cases one in a billion . . . are suspect."²³ DNA fingerprint evidence was seriously challenged in the courts for the first time in a New York double murder case, *People v. Castro*.²⁴ In a pre-trial *Frye*²⁵ hearing, the experts for both sides in an unusual non-adversary manner, jointly participated in a careful inquiry into the reliability and admissibility of DNA forensic evidence.²⁶

In addition to the New York Supreme Court in *Castro*,²⁷ the Minnesota

[T]here is no demonstrated general acceptance or inherent rationality of the process by which Cellmark arrived at its conclusion that one Caucasian in 59,000,000 would have the DNA components disclosed by the test that showed an identity between the defendant's DNA and that found on the nightgown.

Commonwealth v. Curin, 565 N.E.2d 440, 442 (Mass. 1991). See *infra* notes 24-31 and accompanying text.

²³ *Report of New York State Forensic DNA Analysis Panel*, State of N.Y. Division of Crim. J. Services 27 (1989) [hereinafter *NY Forensic DNA Panel Report*].

²⁴ *People v. Castro*, 144 Misc.2d 956, 545 N.Y.S.2d 985 (1989). During the pre-trial scientific hearing in *Castro*, Dr. Michael Baird of Lifecodes Corporation reported the odds of a random match between a bloodstain and the suspect at "one in 100 million." Neufeld & Colman, *When Science Takes The Witness Stand*, *Sci. Am.*, May 1990, at 46-48. "Dr. Eric S. Lander . . . examined the same data and arrived at odds of one in 24." *Id.* at 48. In *Castro*, the court upheld the validity of DNA profiling, but ruled that Lifecodes Corporation failed to use generally accepted scientific techniques for obtaining reliable results in that particular case, and for establishing the frequencies with which random matches might occur between two different individuals within a population. *Nat'l L. J.*, Oct. 9, 1989, at 6 col. 1.

²⁵ *Frye v. United States*, 293 F. 1013, 54 App. D. C. 46 (1923). In determining the legal standard of admissibility of novel scientific evidence, New York follows the rule as originally set forth by the *Frye* court:

Just when a scientific principle or discovery crosses the line between the experimental and the demonstrable stages is difficult to define. Somewhere in this twilight zone the evidential force of the principle must be recognized, and while courts will go a long way in admitting expert testimony deduced from a well recognized scientific principle or discovery, the thing from which the deduction is made must be sufficiently established to have gained general acceptance in the particular field in which it belongs.

Id. at 1014. The New York Court of Appeals has explained the *Frye* test as follows: "[T]he test is not whether a particular procedure is unanimously endorsed by the scientific community, but whether it is generally acceptable as reliable." *People v. Middletown*, 54 N.Y.2d 42, 49, 429 N.E.2d 100, ___, 533 N.Y.S.2d 581, ___ (1981).

²⁶ This scientific pre-trial hearing took place over a four month period producing a transcript of approximately five thousand pages. *Castro*, 545 N.Y.S.2d at 986. Richard Roberts, a molecular biologist, stated "The court system is adversarial and expert witnesses are encouraged to go further in their statements than they might be prepared to go. We all did so much better when we sat down without the lawyers and had a reasoned scientific discussion." Lewin, *DNA Typing on the Witness Stand*, 244 *SCIENCE* 1033, 1035 (1989).

²⁷ *People v. Castro*, 144 Misc.2d 956, 545 N.Y.S.2d 985 (1989).

Supreme Court in *State v. Schwartz*,²⁸ the Connecticut Superior Court²⁹ (the only reported case in which a jury rejected the results of DNA evidence, but to find guilt, not innocence), as well as several trial courts³⁰

²⁸ In *State v. Schwartz*, 447 N.W.2d 422 (Minn. 1989) the Minnesota Supreme court precluded admission of DNA profiling evidence. The *Schwartz* court held that trial courts should rely on a standard set forth in *State v. Joon Kyu Kim*, 398 N.W.2d 544 (Minn. 1983) which placed a limitation on the use of population frequency statistical probability evidence "because of the danger that such evidence will have a potentially exaggerated impact on the trier of fact." *Id.* at 548 (quoting *State v. Boyd*, 331 N.W.2d 480, 482 (Minn. 1983)); see also *State v. Carlson*, 267 N.W.2d 170, 176 (Minn. 1978). The *Boyd* court emphasized that:

[I]t is [not] necessarily wrong to inform the jury of the underlying statistical evidence but that there is a real danger that the jury will use the evidence as a measure of the probability of the defendant's guilt or innocence, and that the evidence will thereby undermine the presumption of innocence, erode the values served by the reasonable doubt standard, and dehumanize our system of justice.

Schwartz, 447 N.W.2d at 428 citing *Boyd*, 331 N.W.2d at 483 (quoting Tribe, *Trial by Mathematics*, 84 HARV. L. REV. 1329, 1355 (1971)). The *Schwartz* court declared that "any probative value of statistical frequency evidence is outweighed by its prejudicial effect, as illustrated by the media exposure forensic DNA typing has received implying its infallibility." *Schwartz*, 447 N.W.2d at 428.

²⁹ In *State of Connecticut v. Hammond*, in Hartford, Connecticut, for the first time a DNA expert from the FBI testified for the defense that semen stains taken from the victim's panties did not come from accused rapist Ricky Charlie Hammond. Nat'l L. J., April 23, 1990 at 9, col. 1. However, even with this evidence the jury returned with a guilty verdict choosing to believe the victim who gave a detailed account of her ordeal. Jurors explained afterward that they disregarded the DNA evidence. *Id.* Speaking in a DNA "update" session at the state's Center for Biotechnology on the State University at Stony Brook campus, Assistant Manhattan Prosecutor Harlan Levy stated that in the Connecticut case the defendant was found guilty after the prosecutor told the jury that the semen evidence may have been contaminated. *Newsday*, Apr. 7, 1990, at 4.

³⁰ In an Arizona murder case, Judge Douglas Keddie of Superior Court in Yuma County issued an order whereby "the results of DNA [fingerprinting] tests performed by the Federal Bureau of Investigation . . . could not be admitted as evidence." Kolata, *Gene Test Barred as Proof in Court*, N.Y. Times, Feb. 14, 1991, at B12, col. 6. In coming to this conclusion Judge Keddie indicated that DNA evidence was "not ready for the courtroom . . . [as] the reliability of DNA [fingerprinting] analysis as legal evidence was still in dispute in the scientific community." Kolata, *supra* note 21; see also Kolata, *Gene Test Barred as Proof in Court*, N.Y. Times, Feb. 14, 1991, at B12, col. 6. Judge Keddie also indicated that DNA fingerprinting "was such a powerful technique and so likely to sway a jury, it must be subjected to the strictest scrutiny." *Id.*; see also Kolata, *supra* note 21.

Further, Judge Keddie strenuously objected to the use of DNA fingerprinting evidence in the courtroom by stating in an interview that such evidence "puts a fist on the scale of justice." N.Y. Times, Feb. 14, 1991, at B12, col. 6. Agreeing with the Arizona judge, Dr. Eric S. Lander stated, "What the judge in Arizona is saying is fascinating and probably right." Kolata, *supra* note 21. See *supra* note 21.

Although Judge Keddie's ruling does not set a binding precedent, it is in stark contrast to a ruling by a federal magistrate in Ohio. See *infra* notes 33-40 and accompanying text.

In San Diego, California, a San Diego County Judge William D. Mudd, ruled in a rape case that due to the flaws in statistical tables used to figure the odds, the figures could not be used, but the court did rule that the tests could be used to rule out the woman's boyfriend, but not to exclude the defendant. L.A. Times, Feb. 15, 1990, at B1, col. 6. Judge Mudd ruled that the novel technique, which examines the genetic marker DNA and can be used to identify a suspect, had

such as Arizona and California, have rejected the conclusions drawn by the DNA evidence.³¹

However, after the most exhaustive and thorough review to date of the scientific and legal validity of DNA profiling, Magistrate James E. Carr of Federal District Court in Toledo, Ohio has ruled in a pre-trial *Frye*³² hearing in the case of *United States v. Yee*³³ that DNA evidence is admissible in a criminal trial.³⁴ Referred to by one of the experts as a "scorched earth review," Magistrate Carr presided over a six week pre-trial scientific *Frye*³⁵ hearing at which thirteen of the nation's leading experts in molecular biology and population genetics examined every aspect of the issue.³⁶ Because no court is apt to repeat the intensive fact-finding process used in the Ohio case, legal experts expect state and Federal courts around the country to rely on the magistrate's findings.³⁷

Magistrate Carr focused on the broader issue of whether DNA testing is scientifically reliable, rather than on the narrow issue of whether the particular testing done in a specific case fully met the criteria set forth in *Frye*.³⁸ On the latter, Magistrate Carr found that issue goes to weight and should be determined by the jury.³⁹ Magistrate Carr concluded that:

[I]t is more likely than not that the general scientific community accepts the reliability and scientific suitability of the F.B.I.'s protocol and practices. . . . These objections, in my opinion, go to weight and not admissibility. . . . [N]o testimony and

met the legal test of being "generally accepted" by forensic experts after a lengthy scientific hearing that started in December 1989. Although DNA evidence has been admitted in other San Diego criminal cases, Judge Mudd's decision marked the first time a San Diego Judge has ruled on the technique after a challenge from an objecting defense attorney. The defendant, Barrett Littleton, was convicted on March 8, 1990, and the jurors stated that the DNA evidence provided corroboration to the victim's identification of him. The victim had identified Littleton at a photo lineup, a live lineup and at the preliminary hearing. *L.A. Times*, May 12, 1990, at B7, col. 1.

³¹ In more than a dozen cases in Maine, Florida Massachusetts, Pennsylvania, California and North Carolina where defense lawyers have seriously challenged forensic DNA evidence through the use of experts, the DNA evidence has subsequently been withdrawn by prosecutors. Labaton, *DNA FingerPrinting Show-down Expected in Ohio*, *N.Y. Times*, June, 22, 1990, at B5, col. 3.

³² *Frye v. United States*, 293 F. 1013, 54 App. D. C. 46 (1923).

³³ *United States v. Yee*, No. 3:89CR0720 (N.D. Ohio Oct. 26, 1990). In the Ohio case, prosecutors claimed that three members of the Cleveland chapter of the Hell's Angels motorcycle club, Steven Wayne Yee, Mark S. Verdi, and John Ray Bonds, conspired to kill David Hartlaubin of Sandusky, Ohio. "A critical piece of evidence against the defendants is an analysis by an FBI laboratory that prosecutors say shows a genetic match between blood taken from one of the defendants, blood found in the car of Mr. Yee and blood found in the van of the murder victim." Labaton, *supra* note 31, at B5, col. 3.

³⁴ Bishop, *Victory for Genetic Fingerprinting*, *N.Y. Times*, Nov. 16, 1990, at B6.

³⁵ *Frye*, 293 F. 1013, 54 App. D.C. 46 (1923).

³⁶ Bishop, *supra* note 34, at 136.

³⁷ *Id.* Labaton, *supra* note 31, at B5, col. 3.

³⁸ *Frye*, 293 F. 1013, 54 App. D.C. 46 (1923).

³⁹ *United States v. Yee*, No. 3:89CR0720, slip. op. at 49 (N.D. Ohio Oct. 26, 1990); Bishop, *supra* note 34, at B6.

... no exhibit [was] sufficient to persuade me that selection of ... [the] system was such a mistaken choice that, either standing alone or in conjunction with the other problems to which the defendants directed their attention, the system is thereby rendered incapable of producing reliable results.⁴⁰

Currently three commercial laboratories, Lifecodes Corporation,⁴¹ Cellmark Diagnostics Corporation,⁴² and Cetus Corporation⁴³ offer three tests for DNA profiling. As of January 1989 the FBI opened an in-house DNA

⁴⁰ United States v. Yee, No. 3:89CR0720, slip. op. at 48-49 (N.D. Ohio Oct. 26, 1990).

⁴¹ Lifecodes Corporation (Saw Mill River Road, Valhalla, NY 10595) offers the "DNA-Print" test which relies on RFLP analysis. Thompson & Ford, *DNA Typing: Acceptance and Weight of the New Genetic Identification Tests*, 75 VA. L. REV. 45, 48 (1989).

⁴² The "DNA fingerprinting" test offered by Cellmark Diagnostics Corporation (20271 Goldenrod Lane, Germantown, MD 20874) also relies on RFLP analysis. *Id.* at 49.

⁴³ Cetus Corporation (1400 53d Street, Emeryville, Cal. 94608) developed a quite different approach for typing DNA which is offered commercially by Forensic Science Associates (3053 Research Drive, Richard, Cal. 94806). *Id.* at 49. The Cetus test uses a unique technique called polymerase chain reaction ("PCR"), also known as allele-specific probe analysis, which "relies on technology [that] is newer and perhaps less widely accepted than the other tests." *Id.* at 49, 50.

PCR allows forensic DNA analysis to be done on a much smaller sample of biological material than is required for RFLP analysis. "Beginning with a single molecule of the genetic material DNA, the PCR can generate 100 billion similar molecules in an afternoon." Mullis, *The Unusual Origin of the Polymerase Chain Reaction*, *Sci. AM.*, Apr. 1990, at 56. Three California cases have dealt with PCR analysis. In *People v. Martinez*, No. A709321 (Sup. Ct. L.A. Co.) the court held, after a pre-trial Frye hearing, that there was no consensus regarding the reliability of PCR technology in the relevant scientific community, that of forensic scientists. Levy, *DNA Evidence in Criminal Cases: Legal Developments*, N.Y.L.J., Apr. 25, 1990, at 6, col. 3. This determination of the relevant scientific community was explicitly rejected in *People v. Mello*, Ind. No. Cr. 27819 (Sup. Ct. Riverside Co. 1989). *Id.*, citing Hearing Transcript at 3801. The Court determined that the relevant scientific community was that of molecular biologists, and that there is a consensus that PCR techniques are reliable for use in biological and medical research if applied properly. "The differences between analyzing clinical samples and forensic samples was held to go to the weight rather than the admissibility of the evidence." *Id.* More recently in *People v. McSherry*, Ind. No. A04264-01 (Super. Ct. L.A. Co. Nov. 20, 1989), the defendant was convicted of abducting and raping a seven year old girl by overwhelming evidence including an eyewitness identification of the defendant by the victim and others. Prior to trial, the semen retrieved from the victim had been submitted to Forensic Science Associates for PCR analysis, but the results which exculpated the defendant were reported after the trial. The defense moved for a new trial, but it was denied. The court ruled that the standard for granting a new trial had not been met because PCR evidence is too new and questionable to support a determination that the jury would have found the PCR evidence convincing and reached a different verdict. N.Y.L.J., Apr. 25, 1990, at 6, col. 3 citing Transcript at 37.

The PCR technique is probably the cutting edge of the new technology of the future according to several experts in the DNA forensic expert community. *DNA-Based Genetic Identification: (Understanding the Double Helix): A Scientific and Legal Approach*, Session of N.Y.S. Judicial Seminar, held in Rochester, New York (July 1990) [hereinafter *N.Y.S. 1990 Judicial Seminar*] (statements of Frank Samuel Baechtcl, Ph.D., FBI Laboratory, Quantico, Virginia, and Dr. Eric S. Lander, Associate Professor, Department of Biology, Massachusetts Institute of Technology and a Member of the Whitehead Institute for Biomedical Research).

testing lab in Quantico, Virginia, and has already developed a sophisticated computerized DNA data bank.⁴⁴

II. FORENSIC USE OF DNA PROFILING IS BORN

For a better understanding of how investigatory agencies wish to use DNA in their criminal investigations, one must go back to the very beginning of the use of DNA "genetic fingerprinting" in criminal activity. It happened, appropriately for all true mystery buffs, in a small English village, the village of Enderby about 100 miles north of London. It involved a Scotland Yard Detective Superintendent named Anthony Painter, and at that time a little known English academic, Alec Jeffreys, a Leicester University geneticist. It was a truly vicious crime—the rape murder of two 15-year-old girls with 2 1/2 years separating the crimes. And most appropriately of all, the murderer was named Colin Pitchfork.⁴⁵

It occurred in the distant shrouded past—September 20, 1987. The Leicestershire police's investigation involved taking more than 5,500 blood and saliva samples from every male between 13 and 30 years of age in the three villages in the immediate area of the crime.

Detective Superintendent Anthony Painter, who was in charge of the investigation, stated that "a strong sense of community outrage among close-knit villagers and an effective police public relations campaign effectively overcame apprehension among some residents that the tests were an invasion of their personal rights."⁴⁶ Indeed, Detective Anthony Painter is quoted as having said "five thousand five hundred and eleven men have voluntarily provided the samples since January and only one had refused."⁴⁷ Only one of the 5,512 males within the age group that was targeted declined to take part voluntarily, and the man who declined had already been ruled out as a suspect. Detective Painter stated, "We made it clear from the start that it was voluntary, [Pitchfork] exercised his legal right."⁴⁸

No one could doubt that such police tactics would have raised serious legal questions in the United States and would have run into strong opposition in urban areas in Britain. How Pitchfork was actually discovered was actually much more mundane.

⁴⁴ The F.B.I. DNA laboratory handled 850 cases in its first year of existence, and the lab is expected to handle as many as 1,500 cases in its second year. The F.B.I. stated that the agency had appeared in 90 court cases in 37 states. N.Y. Times, June 22, 1990, at 5, col. 3. Weiss, *DNA Takes the Stand*, SCI. NEWS, July 1989, at 74. In June of 1989 the FBI asked its new agents to submit to just one more exam, a so-called "voluntary" blood test. Each acquiescing agent received a "free" cleverly worded t-shirt emblazoned with the motto: "DNA: You leave it, we cleave it." *Id.* Clearly this type of so-called "voluntary" testing will be pressed for by private industry as well.

⁴⁵ The account of the Colin Pitchfork case is taken from reports in the L.A. Times, Sept. 22, 1987, at 6, col. 1; L.A. Times, Jan. 23, 1988, at 3, col. 1; N.Y. Times, Nov. 6, 1988, (Magazine), at 70; N.Y.L.J., Jan. 23, 1990, at 1, col. 2; and the Boston Globe, Feb. 25, 1990, (Magazine), at 44.

⁴⁶ L.A. Times, Jan. 23, 1988, at 3, col. 1.

⁴⁷ L.A. Times, Sept. 22, 1987, at 6, col. 1.

⁴⁸ N.Y.L.J., Jan. 23, 1990, at 6, col. 4.

Did DNA analysis identify the culprit? Surprisingly, NO! The case was cracked when a woman heard a barroom conversation about Pitchfork's efforts to find someone to provide samples for him. She reported the incident to the police, and Pitchfork was detained. Pitchfork had already persuaded a colleague at work to supply blood and saliva samples on his behalf. Thus, the DNA failed to identify him. Pitchfork later submitted to new genetic tests which created a positive identification. He then confessed.⁴⁹

III. THE DNA PROFILE: PRIVACY CONCERNS

Technology is currently enhancing our ability to identify a variety of genetic diseases prior to birth.⁵⁰ The future application of DNA analysis could be even broader, including for example the determination of genetic risk factors for diabetes, heart disease, and cancer.⁵¹

There are now over 4,000 known single-gene hereditary illnesses.⁵² Dr.

⁴⁹ Boston Globe, Feb. 25, 1990, (Magazine), at 44.

⁵⁰ Silverman, *DNA Analysis in the Detection of Genetic Diseases*, 4 NEW DEV. IN MED. 69 (1989).

⁵¹ Rapid developments are being made in understanding genetic susceptibility to the more common illnesses, including heart disease and cancer. *Id.* "[S]tudies of selected RFLP markers in human families have revealed the linkages for more complex and more common diseases. Evidence suggests that specific genes or groups of genes predispose individuals to some forms of cancer, emphysema, juvenile diabetes, Alzheimer's Disease, cleft palate, heart disease, and mental illness." D. NELKIN & L. TANCREDI, *DANGEROUS DIAGNOSTICS: THE SOCIAL POWER OF BIOLOGICAL INFORMATION* 28 (1989). Studies suggest that DNA profiling analysis provides a useful technique for the examination of cancer-associated genetic disorders. White, Neuwirth, Miller, & Schneider, *DNA Alterations in Prostatic Adenocarcinoma and Benign Prostatic Hyperplasia: Detection by DNA Fingerprint Analysis*, 237 MUTAT. RES. 37-43 (1990); See also Leppert, Burt, Hughes, et al., *Genetic Analysis of an Inherited Predisposition to Colon Cancer in a Family With a Variable Number of Adenomatous Polyps*, 322 NEW ENG. J. MED. 904-08 (1990); Telenius, Mathew, et al., *Application of Linked DNA Markers to Screening Families with Multiple Endocrine Neoplasia Type 2A*, 16 EUR. J. SURG. ONCOL. 134-40 (1990); Thein, Jeffreys, et al., *Detection of Somatic Changes in Human Cancer DNA by DNA Fingerprint Analysis*, 55 BR. J. CANCER 353-56 (1987).

⁵² Coles, *The Pros and Cons of Freedom of Access to Human Genome Data*, 333 NATURE 692 (1988); Brock, *A Consortium Approach to Molecular Genetic Services*, 27 J. MED. GENET. 8-13 (1990). "Many genetic diseases transmitted by monogenic inheritance (ie, autosomal dominant, autosomal recessive or X linked) have been assigned their exact chromosomal location by demonstrating genetic linkage (ie, close contiguity in a given chromosome) between one or another of the ubiquitous DNA markers and the defective gene." Motulsky, *supra* note 8, at 2855. The discovery of the gene for Huntington's Disease (located on the short arm of chromosome 4) made it possible to screen the DNA of individuals for this disease through the use of DNA genetic predictive testing. Somviele, Went, Petit, et al., *Ethical Issues Policy Statement on Huntington's Disease Molecular Genetics Predictive Test*, 27 J. MED. GENET. 3438 (1990). Through the use of amniocentesis (a genetic test of the amniotic fluid from women carrying fetuses, which provides a sample of the genome of the fetus) and the availability of tightly linked DNA markers, prenatal diagnosis of cystic fibrosis (as well as prediction in adults) based on linkage analysis is possible. Lemna, Feldman, et al., *Mutation Analysis For Heterozygote Detection and the Prenatal Diagnosis of Cystic Fibrosis*, 322 NEW ENG. J. MED. 291 (1990). The CF gene is located on chromosome 7. Motulsky, *supra* note 8, at 2855. Other examples include the genes for polycystic kidneys (chromosome 16), and Duchenne type muscular dystrophy (X chromosome). *Id.* at 2855. The discovery of the gene for the disease, neurofibromatosis, more com-

Eric S. Lander, a leading geneticist, has observed that: "[F]or the medical geneticist, these differences have provided a virtually limitless supply of genetic markers that can be used to trace the inheritance of human diseases. By studying these DNA differences, it has been possible to pinpoint the location of the genes which cause many human diseases."⁵³ Research in gene mapping could eventually make it very possible to diagnose most of these diseases from the examination of a trace DNA sample.⁵⁴ DNA profiling techniques have advanced genetic screening from testing adults,⁵⁵ to testing fetuses,⁵⁶ to testing the unfertilized human egg.⁵⁷ The DNA testing can predict which individuals will be predisposed

monly known as Elephant Man's disease, is the first for a hereditary disease of the nervous system. Using the isolated gene, it is now possible to screen individuals' DNA to identify those with the disorder. Angier, *Scientists Discover the Gene in a Nervous System Disorder*, N.Y. Times, July 13, 1990, at A1, col. 2.

⁵³ *FBI Oversight and Authorization Request for Fiscal Year 1990: Hearing Before the Subcomm. on Civil and Constitutional Rights of the House Comm. on the Judiciary*, 101st Cong., 1st Sess. 367-431 (1989) [hereinafter *DNA Hearing*] (statement of Dr. Eric S. Lander, Associate Professor, Department of Biology, Massachusetts Institute of Technology and a Member of the Whitehead Institute for Biomedical Research).

⁵⁴ Although the quality and quantity of DNA material recovered as evidence can be limiting, it appears that the polymerase chain reaction ("PCR"), which allows rapid amplification of minute amounts of DNA, is revolutionizing molecular biology. Howlett, *DNA Forensics and the FBI*, 341 NATURE 182 (1989). "Indeed, it has already been shown that PCR can be used to make possible the typing of DNA from single hairs." *Id.* Starting with a single molecule of DNA, PCR can generate an unlimited number of replications of that molecule. Mullis, *supra* note 43, at 56.

⁵⁵ A new test allows for the detection of 76% of all adults who risk having children with cystic fibrosis. Soon routine screening of every American adult for this defect will be possible as more accurate versions of the test become available. *New Test Detects a Genetic Defect*, N.Y. Times, Feb. 2, 1990, at A20; Lemna, Feldman, et al., *supra* note 52, at 291.

⁵⁶ Amniocentesis is perhaps the most well-known form of prenatal screening for congenital and genetic disease. Because amniocentesis provides a sample of the genome of the fetus, it may be used for detection of biochemical abnormalities at the genetic level in the DNA. Amniocentesis is generally used to detect the presence of up to 180 genetic disorders, including sickle-cell anemia, Huntington's Disease, cystic fibrosis, and Duchenne muscular dystrophy. NELKIN & TANCREDI, *supra* note 51, at 26. "Chorionic villus sampling (CVS), a new prenatal screening technique, can detect genetic abnormalities in a tissue sample from the embryonic membrane that surrounds a young fetus. Using gene probes or chromosomal analysis, CVS can test a fetus at ten weeks, a stage at which termination of a pregnancy is relatively uncomplicated." *Id.* at 27. Professor Robert Winston, the Director of Europe's largest infertility clinic at Hammersmith Hospital in west London, reported screening a test-tube embryo (which consisted of only a few cells) for a genetic defect. Professor Winston stated that the clinic would soon report a successful pregnancy by transferring the screened embryo to the mother. *The Daily Telegraph*, Feb. 10, 1990, at 4. "In the technique, a cell is fertilized outside the body and grown to an egg consisting of eight cells. One cell is removed and its genetic material analysed. Research has confirmed that removal does not damage the embryo's potential." *Id.*

⁵⁷ Scientists from the Illinois Masonic Medical Center in Chicago reported that they had diagnosed inherited enzyme deficiency at the ultimate source, the unfertilized human egg, of a woman carrying the defect. Bishop, *Detecting Gene Defects in Unfertilized Eggs*, Wall St. J., Feb. 8, 1990, at B1, col. 1. "The researchers plucked eight newly formed eggs from the woman just after the eggs had recombined the normal 23 pairs of gene containing chromosomes into a set of 23 single

to behavioral problems such as alcoholism⁶⁸ and theoretically even to mental illness.⁶⁹ Science has thus been able to predict, at least in some instances, who will be genetically predisposed to hereditary medical problems, and what the probability of that predisposition will be.

A massive federal project, called the Human Genome Project⁶⁰ has been steadily developing. This undertaking is designed to delineate the three billion chemical building blocks of human genetic makeup by using the DNA profiling techniques.⁶¹ The information gleaned will become available at an increasingly rapid rate.⁶²

Because of the scale of the project, hundreds of human genes will be identified, giving doctors the ability not only to predict who will be born with one of the known 4000 inherited disor-

chromosomes. At this early stage, the set of chromosomes that was about to be discarded was still in each egg. The researchers were able to extract the discarded chromosomes from seven of the eggs without damaging the eggs' capacity to be fertilized and to form an embryo." *Id.* Therefore, as a result of this new genetic technique, the "eight donated eggs could be tested and only those eggs without the defective gene would be fertilized." *Id.*

⁶⁸ Research has demonstrated convincingly, over the past two decades, that there is a genetic predisposition to alcoholism. Crabb, *Biological Markers for Increased Risk of Alcoholism and for Quantitation of Alcohol Consumption*, 85 J. CLIN. INVEST. 311 (1990). A scientific study conducted by Dr. Ernest P. Noble of the University of California at Los Angeles and by Dr. Kenneth Blum of the University of Texas Health Science Center in San Antonio linked a specific gene (the receptor gene for dopamine) to alcoholism. Altman, *Scientists See a Link Between Alcoholism and a Specific Gene*, N.Y. Times, April, 18, 1990, at A1, col. 1, A18, col. 4.

⁶⁹ Scientific evidence suggests that particular genes or groups of genes predispose individuals to some forms of mental illness. NELKIN & TANCREDI, *supra* note 53, at 28. The fact that the science of DNA may increasingly develop markers for some medical and/or emotional conditions is important and frightening if this information is not channelled correctly. Of course, any such markers for psychological conditions would be subject to the nature/nurture controversy.

⁶⁰ Within the next 15 years, at a cost of an estimated \$3 billion, the human genome project will try to identify the complete code of every one of the 50,000 to 100,000 genes that comprise the genome, the genetic blueprint of a human being. Angier, *Great 15-Year Project to Decipher Genes Stirs Opposition*, N.Y. Times, June 5, 1990, at C1. "The idea behind a genetic map is to blanket the chromosomes with genetic markers—tiny, variable pieces of DNA—ideally evenly spaced, and the closer the better. With the chromosomes thus covered, it should be possible to locate any gene between two markers." Roberts, *Whatever Happened to the Genetic Map?*, 247 SCIENCE 281 (1990). The usefulness of the genetic map depends on its resolution, the distance between the genetic markers, which is measured in centimorgans, or a physical distance of approximately 1 million bases. *Id.* at 281. The Center for Human Genome Research at the National Institute of Health ("NIH") is spending roughly \$5.5 million on genetic mapping, but most of the money is really going towards mapping the regions around disease genes, not to the original strategy of blanketing all the chromosomes with markers. *Id.*

⁶¹ Roberts, *Whatever Happened to the Genetic Map?* 247 SCIENCE 281 (1990); Angier, *Great 15 Year Project to Decipher Genes Stirs Opposition*, N.Y. Times, June 5, 1990, at C1; *The Price of Knowledge: Genetic Tests That Predict Dire Conditions Become a Two-Edged Sword*, Wash. Post, Oct. 10, 1989, (Health), at 27.

⁶² Merz, *Promising New Technique May Accelerate Genome Mapping*, 262 J. A.M.A. 2353 (Nov. 3, 1989).

ders, but also which infants will be born with a predisposition for the more common illnesses involving several genes, such as cancer and heart disease.⁶³

The Director of the National Center for Human Genome Research at the National Institute of Health, Nobel Laureate Dr. James D. Watson,⁶⁴ cautioned about the ethical implications of the project, most notably an individual's right to privacy. Dr. Watson declared, "[Society] has to recognize the terrible past of eugenics and the way incomplete knowledge has been used. [Society has] to ensure people that the knowledge encoded in their own DNA is private. [Society] must protect that."⁶⁵

⁶³ *The Price of Knowledge: Genetic Tests That Predict Dire Conditions Become a Two-Edged Sword*, *supra* note 61, at 27.

⁶⁴ Dr. James D. Watson and Francis Crick won the 1962 Nobel prize for the discovery of the helical structure of DNA. Watson, *DNA Mapping: All Hands Down*, *Newsday*, Nov. 5, 1989, (Ideas), at 4.

⁶⁵ Dr. Watson stated that 3% of the budget for the Human Genome Project would be spent on privacy concerns, but believed this should not be a limit and condoned spending whatever is necessary to ensure that privacy concerns will be taken seriously. *The Price of Knowledge: Genetic Tests That Predict Dire Conditions Become a Two-Edged Sword*, *supra* note 61, at 27. In the early 1900s Charles Davenport and the Carnegie Institution of Washington founded the first American genetics laboratory at Cold Spring Harbor, and through the 1930s, the lab promoted the racist pursuit of the notorious American eugenics movement. Unger, *Old Racist Pursuits*, *Newsday*, July 10, 1990, (Discovery), at 9. The eugenics doctrine was a term coined by Francis Galton, Charles Darwin's cousin, which labeled entire races and national and ethnic populations as inferior or unfit. Office of Technological Assessment, U.S. Congress, *Biology, Medicine, And The Bill Of Rights: A Special Report*, 44 (Washington, D.C.: Government Printing Office, September 1988) [hereinafter *Biology Medicine And The Bill Of Rights*]. "Galton sought to improve human genetic stock by giving what he called the more suitable races or strains of blood a better chance of prevailing over the less suitable [less suitable races meant everybody except white Anglo-Saxon Protestants, according to Daniel J. Kelves, a historian of science at the California Institute of Technology and an authority on eugenics]. . . . Davenport, the first Director of the summer biological Laboratory at Cold Spring Harbor, was a Harvard professor who had helped determine the genetics of male colorblindness, [but he soon switched his focus to promoting [the goal of eugenics]." *Newsday*, July 10, 1990, at 9. A Eugenics Records Office next to the biological laboratory was created. Davenport, asserting that dilution of authentic American bloodlines endangered U.S. democracy, had hundreds of college students spread the eugenics gospel after being trained at the eugenics office (funding for which was made possible by many influential people, including \$22,000 from John D. Rockefeller Jr.). *Id.* Harry H. Laughlin ran the eugenics office, and soon Laughlin and Davenport became known as authorities on biological science. Their so-called scientific testimony helped pass sterilization laws in more than 24 states, and from 1907 to 1908 approximately 8,000 men and women considered "defectives" [including individuals who were retarded, mentally ill, alcoholics, the blind, deaf and deformed, epileptics, and the overly licentious] were sterilized. *Id.* at 10. See *Buck v. Bell*, 274 U.S. 200 (1927) (The Court upheld a sterilization order against a 17 year old retarded woman with Justice Oliver Wendell Holmes stating, "Three generations of imbeciles are enough.") *But see Skinner v. Oklahoma*, 316 U.S. 535 (1942) (Where Justice Douglas, writing for the court referred to "[t]he power to sterilize if exercised, may have subtle, far-reaching and devastating effects."). See also W. CURRAN & E. SHAPIRO, *LAW, MEDICINE, AND FORENSIC SCIENCE* 923-26 (1982). Davenport retired in 1934, and with the rise of the Nazis, Carnegie Institute withdrew all support of the eugenics program in 1940. *Newsday*, July 10, 1990, at 10.

A small amount of DNA can provide a tremendous amount of information about an individual, including to whom he or she is related and what diseases he or she is carrying or is predisposed to carrying.⁶⁶ In effect, DNA can be used to invade an individual's privacy.⁶⁷ Indeed, as the bill entitled New York State Forensic DNA Laboratories which recently passed the New York State Legislature⁶⁸ stated:

DNA data banking potentially threatens one of the most fundamental spheres of privacy in a democracy; A citizen's genetic make-up. Before embarking on the expensive, complex and delicate task of creating a DNA data bank, it is essential that the forensic DNA technology underlying the enterprise meet the highest standards of reliability and that the most rigorous privacy protection be imposed.⁶⁹

DNA, more than any other forensic test, presents a direct challenge to our basic right to privacy.⁷⁰ We must remember that the study of an

⁶⁶ The study of an individual's DNA can reveal much more than a unique fingerprint because DNA holds information on an individual's entire genetic make-up. *DNA Hearing, supra* note 53, (opening statement of Congressman Don Edwards). "Utilizing the principles of nucleotide base-pairing for specific hybridization between a DNA or RNA probe and its complementary target sequence, molecular diagnostic techniques are finding ever-increasing applications across the entire spectrum of human disease." Grody, Gatti, & Naeim, *Diagnostic Molecular Pathology*, 2 MOD. PATHOL. 553 (1989).

⁶⁷ "The right of privacy . . . contains both the concept of autonomy and the concept of confidentiality of personal information. . . . Rapidly advancing techniques for reducing the individual to a collection of biological facts and measurements are likely to increase the need for explicitly defining the scope and nature of this guarantee." *Biology Medicine And The Bill Of Rights, supra* note 65, at 57. Dr. Watson, now Director of Cold Spring Harbor Laboratories in New York, stated at a genetics conference at Leicester University in London, that he wanted new laws that would ensure protection of the individual's right to privacy over his or her genetic make-up. Connor, *DNA Pioneers Urge Tougher Controls On Genetic Data*, THE INDEPENDENT, April 8, 1990, at 3. Dr. Watson, who is coordinating the 15-year Genome Project, stated that the Human Genome Project must not be stopped by ethical worries because many diseases had a genetic component. "I want to go ahead with the Human Genome Project. I don't feel a Hitler-like individual. I know there will be ethical dilemmas and will have to be prepared for them." *Id.*

⁶⁸ N.Y.S. Bill A. 11073, N.Y. Pub. Health Law Art. 5-A Forensic DNA Laboratories (passed in Assembly and Senate July 1990) [hereinafter *N.Y.S. Bill 11073*].

⁶⁹ *Id.* at 2.

⁷⁰ E. Donald Shapiro, *Dangers of DNA: It Ain't Just Fingerprints*, N.Y.L.J., Jan. 23, 1990, at 1, col. 2. The power of forensic DNA technology makes abuse a serious concern. *NY Forensic DNA Panel Report, supra* note 23, at 1.

individual's DNA is not like a "fingerprint"⁷¹ which can be used only for identification purposes.⁷² Identification characteristics of DNA profiling are only a by-product of the science.⁷³

The Federal Bureau of Investigation (F.B.I.) contends that it is only data banking information which bears no genetic significance.⁷⁴ This is not scientifically possible because at this time science does not know which

⁷¹ Shapiro, *supra* note 70, at 1, col. 2. "This is not a fingerprint. This is a genetic profile. It's used for identity purposes, but it can be used for much more." *Nightline: DNA Fingerprinting*, (ABC television broadcast, Aug. 15, 1989) [hereinafter *Nightline*]; "Even the name DNA fingerprinting suggests something it really isn't," stated James W. Geyer a founder of Genetic Design Inc. in Greensboro, N.C. *N.Y. Times*, Jan. 29, 1990, at A1, A18, col. 5. "Although, . . . the term 'fingerprinting' has long been used in biochemistry for any analytical procedure for partially characterizing molecules based on patterns obtained in a separation scheme. E.g., peptide fingerprinting of proteins has been done since the 1950's; RNA fingerprinting was done in the 1960's. The unfortunate thing here is that the two rather distinct usages of the word 'fingerprint' clashed." Letter from Dr. Eric S. Lander to Prof. E. Donald Shapiro (August 30, 1990).

⁷² DNA profiling techniques have rapidly increasing applications including "infectious diseases (using DNA probes for viruses, bacteria, and parasites), neoplastic diseases (through detection of gene rearrangements, tissue-specific gene transcription, and oncogene activation), hereditary diseases (by screening for specific mutated genes or linked DNA polymorphisms), and the differentiation of individuals from one another by DNA Fingerprinting (for purposes of donor recipient identification in transplants, paternity testing, or forensic investigations.)" Grody, Gatti, Naeim, *supra* note 66, at 553. See also *supra* note 52, *infra* note 74 and accompanying text.

⁷³ Forensic DNA techniques were developed initially in medical research of inherited diseases; see *supra* note 7. The idea of constructing a map of all human genes was first proposed in the 1930s. M. CUMMINGS, *HUMAN HEREDITY: PRINCIPLES AND ISSUES* 82 (1988). A massive accelerated federal project has been undertaken to map the location of all human genes and to determine the precise order of the DNA bases that encode this genetic information. "The sooner the entire genome is mapped and sequenced, the sooner scientists can get on with the real work of human biology: understanding what the genes do," stated Nobel Laureate James D. Watson, who is co-ordinating the Human Genome Project. *Newsday*, Nov. 5, 1989, (Ideas), at 4.

⁷⁴ William Sessions, Director of the Federal Bureau of Investigation, claims that the FBI data bank will have the DNA profile on file "only to compare criminal nature, criminal prosecutions or criminal subjects in different places to try and identify them." *Nightline*, *supra* note 71, at 6. Director Sessions further claimed that "the forensic examinations [the FBI performs] on that genetic material are not used to find medical or behavioral aspects of the individual." *Id.* at 7. "The [DNA] tests [that the FBI performs] do not recognize any known functional inherited trait or characteristic and cannot be used to diagnose disease conditions. The [DNA] tests specifically respond to what are referred to as noncoding regions on the DNA molecule. . . ." *DNA Hearing*, *supra* note 53, at 7 (statement of John W. Hicks, Deputy Assistant Director Laboratory Division Federal Bureau of Investigation). *But see infra* note 75 and accompanying text.

information is genetically significant.⁷⁵ Moreover, some state statutes require the entire DNA sample be kept on file by the authorities in the DNA data bank.⁷⁶

Indeed, what safeguards exist except the word of the police agency that the rest of the DNA profile has been destroyed and not data banked, since the entire DNA genetic profile must be obtained before any DNA markers can be determined.⁷⁷ The hollowness of such assurances of the authorities on the elimination of any so-called relevant genetic material from data banking is graphically demonstrated by the actions of the current com-

⁷⁵ Westin, *A Privacy Analysis of the Use of DNA Techniques as Evidence in Courtroom Proceedings*, 32 BANBURY REPORT: DNA TECHNOLOGY AND FORENSIC SCIENCE 25-42 (1989). "I am not aware of any formal proof that any of these [human genetic DNA] regions is a non-coding region. There are examples showing that some of these regions are coding and that they are probably all coding." *Id.* at 36 (statement of Dr. Alec Jeffreys, Lister Institute Research Fellow at Leicester University, and creator of the DNA Fingerprinting technique, see *supra* note 12). "There is a very variable 30-kb region close to the Harvey *ras* gene. There was a paper . . . suggesting that there was an association between the presence of certain rare alleles of genetic variants of that locus and a predisposition to ovarian or bladder cancer. . . . Other groups have [also] suggested that there are associations there. That is a perfect example of a variable region, if it were true, that would give you information beyond individual identity and give you information about predisposition to certain cancer states." *Id.* at 39 (comments of Dr. Alec Jeffreys). "I agree that there is nothing meaningful one could say on the basis of the probes . . . at the moment. If we are thinking about this technology in the long run, we might as well think about it into the future of perhaps 10 or 20 years, probably not much longer, when we will be able to say a lot more on the basis of it. . . . I believe it is probably fair to think about [this technology] in a world where there are probes one can type that will have meaningful associations with things and genes that we know will be useful." *Id.* at 38 (comments of Dr. Eric S. Lander, Associate Professor, Department of Biology, Massachusetts Institute of Technology and a Member of the Whitehead Institute for Biomedical Research). As knowledge regarding an individual's genetic make-up advances, this new information will be used to determine whether people are susceptible to certain inherited diseases, behavioral and medical problems. Associated Press News Service Story, July 12, 1990, citing *N.Y.S. 1990 Judicial Seminar*, *supra* note 43, (comments of Prof. E. Donald Shapiro, New York Law School, and Dr. Eric S. Lander, Member, Whitehead Institute for Biomedical Research).

⁷⁶ See *infra* notes 82-89 and accompanying text. "[S]ome probes used in forensic science locate alleles that lie near a disease locus, thus there may be some association between the [so-called] "junk" DNA and the disease locus. The possibility exists to test DNA acquired specifically for identification purposes for disease information in a database. This option may become more attractive over time, especially as the number and types of probes for genetic orders increase." Office of Technological Assessment, U.S. Congress, *Genetic Witness: Forensic Uses of DNA Tests*, 132 (Washington, D.C.: Government Printing Office, (July 1990)) [hereinafter *Genetic Witness*]. Currently, the enzyme system used to test DNA amplified using the PCR technique can reveal important information regarding a disease condition. *Id.* at 132-33.

⁷⁷ Vogel, *The Case of the Unraveling DNA*, DISCOVER, Jan. 1990, at 46; Hegele, *supra* note 10, at 669; Jeffreys, Wilson, Thein, *supra* note 12, at 76; Gill, Jeffreys, Werret, *supra* note 12, at 577.

mercial groups involved.⁷⁸ Lifecodes Corporation⁷⁹ will start data banking "DNA profiles of newborn infants for parents who wish to be able to trace and positively identify kidnapped, runaway or otherwise estranged children. The immigration authorities, other government agencies, and private doctors also are considering ways to keep genetic tabs on the people they serve."⁸⁰

The DNA profile or so-called DNA fingerprint holds information which describes an individual's entire genetic makeup, including physical characteristics and predisposition to disease.⁸¹ Because of the sensitivity of this genetic information, there are grave concerns about individual privacy and civil liberties.⁸² It is important that the law realize it is simply not a matter of what we can currently read from the DNA profile analysis, but what we will be able to read from this genetic information in the very near future.⁸³

⁷⁸ "Lifecodes, Cetus, [and] Cellmark . . . already sell or have plans to market biomedical DNA testing kits for diagnosis of genetic diseases ranging from cancer to color blindness. Lifecodes also is going into the business of banking the DNA profiles of convicted sex offenders such as provided for under new laws in California and Colorado and would add murderers, kidnapers and other serious felons in states considering such legislation." Unger, *Court Challenge Casts Pall Over DNA Testing Industry*, *Newsday*, July 30, 1989, (Business), at 45.

⁷⁹ Lifecodes provides "about 70 percent of all the materials necessary for this work [DNA testing and DNA data banking] to other companies and agencies including the Federal Bureau of Investigation." Unger, *supra* note 78, at 47.

⁸⁰ *Id.* at 45. In July of 1989, Lifebank, Inc., (a subsidiary of Quantum Chemical Corporation and sister company of Lifecodes) was created for the purpose of providing neonatal storage services by extracting DNA from a newborn's umbilical cord blood and creating a DNA profile. *Genetic Witness*, *supra* note 76, at 131. "The [DNA] profile and remaining DNA sample will be preserved at Lifebank facilities for 18 years." *Id.*

⁸¹ *DNA Hearing*, *supra* note 53, at 1 (statement of Congressman Don Edwards).

⁸² *DNA Hearing*, *supra* note 53, at 1 (statement of Congressman Don Edwards). Definitions of privacy agree on a core concept: that privacy is the claim of an individual to determine what information about herself or himself should be made available to others, when such information may be obtained, and what uses of it may be made by others. Westin, *supra* note 66, at 27. Private companies and the government plan to keep files on violent criminals in DNA data banks. *DNA Fingerprinting Called Privacy Threat*, *Wall St. J.*, Feb. 6, 1990, at B1.

But E. Donald Shapiro, a New York Law School professor, warns that as data banks proliferate, they will keep samples not just from criminals but from other segments of the population. He predicts that when scientists master DNA codes, insurers and employers will tap DNA data banks to learn about job applicants' personality traits and hereditary propensities for diseases, all without the applicants' knowledge.

Id. See also Note, *supra* note 3, at 536 (warning that in the future the preferred form of identification, rather than a social security number or a driver's license could be a plastic card with a computerized version of an individual's DNA profile).

⁸³ The collection of so-called "junk" DNA, according to some experts, will start society down the road toward the invasion of privacy. These experts fear that DNA "junk" samples stored for identification purposes will be tested for medical information or behavioral characteristics as technology becomes more advanced and new probes are developed. *Genetic Witness*, *supra* note 76, at 136. Some experts fear that "genetic testing will not be limited to identity but will expand to include proclivity toward disease (e.g. cancer or coronary disease) . . . that could then find their way into the database." *Id.* at 21.

IV. DNA DATA BANKS: THE THREAT TO PRIVACY AND THE ILLUSION OF GOVERNMENTAL PROTECTION

Many states⁸⁴ including Arizona,⁸⁵ California,⁸⁶ Colorado,⁸⁷ Florida⁸⁸ Iowa,⁸⁹ Minnesota,⁹⁰ Nevada,⁹¹ South Dakota,⁹² Virginia,⁹³ and Washington,⁹⁴ have legislation authorizing the banking of DNA data in DNA "data

⁸⁴ Not included in the scope of this article are state statutes and practices involving DNA analysis used exclusively to determine paternity.

⁸⁵ DNA testing of convicted sex offenders is required. ARIZ. REV. STAT. ANN. § 31-281 (1989).

⁸⁶ On Oct. 1, 1989, the California legislature passed a bill which allowed for the creation of a DNA data bank. 1989 CAL. STAT. ___, Ch. 1304. The new law requires that blood and saliva samples be taken from convicted felons, prior to being released on parole, and sent to the Department of Justice for DNA analysis. The DNA will be filed in a computerized data bank system, or with the offender's file maintained by the Sex Registration Unit of the Department of Justice. *Id.*

⁸⁷ As a condition of parole, the board shall require any offender convicted of an offense for which the factual basis involved a sexual assault . . . to submit to chemical testing of his blood to determine the genetic markers thereof and to chemical testing of his saliva to determine the secretor status thereof. Such testing shall occur prior to the offender's release from incarceration, and the results thereof shall be filed with and maintained by the Colorado Bureau of Investigation.

COLO. REV. STAT. § 17-2-201 (1989).

⁸⁸ Any person convicted of any offense relating to sexual battery or relating to "lewd and lascivious" conduct shall be required to submit specimens of blood for DNA analysis. "The analysis, when completed shall be entered into the automated data base. . . ." FLA. STAT. ANN. § 943.325 (West 1990).

⁸⁹ "[T]he court may determine if the defendant shall be required to provide a physical specimen to be submitted for DNA profiling." 1990 IOWA LEGIS. SERV. 2413 (West).

⁹⁰ DNA analysis of sex offenders is required. ". . . [a court] shall order the person to provide a biological specimen for the purpose of DNA analysis as defined in section 299C.155. The biological specimen . . . shall be maintained by the bureau of criminal apprehension." MINN. STAT. § 609.3461 (1989); "The bureau shall . . . maintain, preserve, and analyze human biological specimens for DNA . . . establish a centralized system to cross-reference data obtained from DNA analysis . . . perform DNA analysis and make data available to law enforcement officials in connection with criminal investigations in which human biological specimens have been recovered." MINN. STAT. § 299C.155 (1989).

⁹¹ Convicted sex offenders must submit to DNA analysis of their blood and saliva, and the results are required to be maintained in the State's criminal history records. NEV. REV. STAT. ANN. § 179A.075 (Michie 1989).

⁹² Blood and saliva samples are to be taken from those convicted and arrested of sex crimes, so that DNA analysis can be performed on such samples. S.D. ADV. LEGIS. SERV. ch. 173 (1990).

⁹³ "Blood sample required for DNA analysis upon conviction of a felony. . . . [The convicted felon] shall have a sample of his blood taken for DNA analysis to determine identification characteristics specific to the person. The analysis shall be performed by the Bureau of Forensic Science within the Division of Consolidated Laboratory Services, Dept. of General Services." The results of the DNA profiling analysis shall be stored and maintained by the Bureau in a DNA data bank. VA. CODE ANN. § 19.2-310.2 (1990).

⁹⁴ WASH. REV. CODE § 43.43.754 (1989).

banks" or "libraries".⁹⁵ Currently, in all of these states, the persons subjected to DNA profiling analysis and DNA banking must be convicted sex offenders, except Iowa and Washington which also include persons convicted of other serious felonies.⁹⁶ The F.B.I. is in the process of establishing a massive computerized DNA data bank program which will not be limited.⁹⁷ Indeed, even many city and county police departments and medical examiners' offices have opened an in-house DNA testing lab and data bank to more accurately and swiftly identify crime suspects.⁹⁸

Why is there a need for such computerized DNA databases if DNA is such an efficient identifier? The answer is simple. It is the same reason the law enforcement community has computerized fingerprint databases.⁹⁹ To be able to effectively use DNA data without a data bank means

⁹⁵ *Statutes Spiral Through the State Legislatures*, 13 SCI. SLEUTHING REV. 11 (Summer 1989). "As of January of 1990, at least five other States—Connecticut, Massachusetts, Michigan, Indiana, and Ohio—have proposed DNA databanking legislation that had not yet been enacted." *Genetic Witness*, *supra* note 76, at 20. In recombinant DNA terminology the terms "gene bank" or "library" have been defined as a collection of clones that contains *all the genetic information in an individual*. CUMMINGS, *supra* note 73, at 168 (emphasis supplied). For present purposes, according to the Ad Hoc Committee on DNA technology, American Society of Human Genetics, "a DNA bank is a facility that stores DNA for future analysis. . . . [T]he long-term stability of DNA may permit questions to be answered later that were not envisioned at the time of its procurement." *DNA Banking and DNA Analysis: Points To Consider*, 42 AM. J. HUM. GENET. 781 (1988).

⁹⁶ *Statutes Spiral Through the State Legislatures*, *supra*, note 95 at 11.

⁹⁷ In January of 1989 the FBI opened an in-house DNA testing lab in Quantico, Virginia, and is already developing a computerized database describing the frequency with which certain genes exist in the U.S. population. Weiss, *supra* note 44, at 74. "The Forensic Science Research Unit of the FBI Laboratory has developed a number of validation protocol steps that should be ascended at the research level before DNA typing techniques will be certified for use on case evidence in our laboratory. These steps are described as follows: 1. Perfect the [DNA] typing methods with fresh body tissues and liquids obtained and stored in a controlled manner." Budowle, Deadman, Murch, & Beachtel, *An Introduction to the Methods of DNA Analysis Under Investigation in the FBI Laboratory*, 15 CRIME LABORATORY DIGEST 8-21 (1988), *reprinted in N.Y.S. 1990 Judicial Seminar*, *supra* note 43, at 26-22.

⁹⁸ Many law enforcement agencies have opened in-house DNA testing labs to more accurately identify crime suspects. *Genetic Witness*, *supra* note 76, at 141-53; *NY Forensic DNA Panel Report*, *supra* note 23, at 28-31; Most of the nearly 300 forensic laboratories in the United States have already started or have plans to start DNA testing. *New York State Leads On Genetic Fingerprinting*, 341 NATURE 90 (1989). The FBI laboratory is committed to supporting state and local laboratories in their efforts to implement DNA testing, and has provided training programs towards that end. *DNA Hearing*, *supra* note 53, at 7 (statement of John W. Hicks, Deputy Assistant Director Laboratory Division FBI). Indeed, even private companies which conduct the DNA profiling forensic technique in the United States plan to keep files on violent criminals in computerized DNA data banks. "But there's a serious threat to privacy caused by DNA fingerprinting, says a forensic law expert who's campaigning against the practice." Wall St. J., *supra* note 14, at B6.

⁹⁹ The law enforcement community currently maintains computerized databases including much personal information such as a person's fingerprints. *Genetic Witness*, *supra* note 76, at 128.

that of necessity investigations would be limited to DNA samples from a narrow range of previously identified suspects in that particular crime. It is much more efficient, indeed essential, in the opinion of the F.B.I. and many law enforcement agencies, that a data bank be created for DNA similar to that which exists for fingerprints.¹⁰⁰ This would allow the investigative agency to match DNA traces found at the scene of a crime with those contained within its computerized DNA databases.¹⁰¹ In fact, the F.B.I. is already establishing a North American DNA forensic database in collaboration with the forensic laboratory of the Royal Canadian Mounted Police,¹⁰² and steps are being taken to establish an international mega-data bank consisting of DNA from Europe, Japan, and North America.¹⁰³

There is ample precedent for such governmental data banking. Currently, governmental agencies, most notably the F.B.I., collect fingerprints from millions of citizens.¹⁰⁴ They are obtained from every conceivable source: from applications for sensitive government security clearance to applications for licenses for the most mundane professions.¹⁰⁵

¹⁰⁰ The Federal Bureau of Investigation has established itself in the DNA testing business and plans to "move toward digitalizing DNA analysis results, in the same way that fingerprints are . . . translated into computer codes." N.Y. Times, *supra* note 17, at 104.

Few people pass through life without having blood taken for some routine purpose. So it would be technically feasible, as soon as the [DNA analysis] process is routinized, to build up a database parallel to an ordinary fingerprint library but enormously larger, indeed potentially covering the entire population and largely without its knowledge.

White & Greenwood, *DNA Fingerprinting and the Law*, 51 MOD. L. REV. 145, 155 (1988).

¹⁰¹ Currently population studies used to calculate the probability that a DNA match could arise by chance are based on small samplings. Larger numbers of DNA data are needed to validate population statistics. *NY Forensic DNA Panel Report*, *supra* note 23, at 31-2. "Data banks of [genetic] population statistics will likely grow with or without forensic science test results (e.g., through efforts to map or sequence the genome)." *Genetic Witness*, *supra* note 76, at 136. Consequently, it is conceivable that every individual in the population will have their genetic profile on record in the next 10 years. See *infra* note 109 & accompanying text.

¹⁰² Hegele, *Molecular Forensics: Applications, Implications and Limitations*, 141 C.M.A.J. 668, 671 (1989).

¹⁰³ Philipson, *The DNA Data Libraries*, 332 NATURE 676 (1988 letter to editor); Soll, Kirschstein, Philipson, Uchida, *DNA Databases Monitored*, 240 SCIENCE 375 (1988 letter to editor).

¹⁰⁴ The government and the private sector regularly collect and "bank" personal information ranging from a person's birthday to their fingerprints. *Genetic Witness*, *supra* note 76, at 128.

¹⁰⁵ Ordinary fingerprinting, through the use of routine administrative procedures, has provided a "forgery-proof method of accurately identifying every member of the population." White & Greenwood, *supra* note 100, at 155.

Conceive of an application and the government takes your fingerprints for its fingerprint database.¹⁰⁶

One should take scant comfort from the fact that some state statutes limit mandatory DNA data banking to convicted sex offenders.¹⁰⁷ As Professor Philip Bereano noted in his testimony before the Subcommittee on Civil and Constitutional Rights of the House Committee on the Judiciary:

Once a technological program like DNA identification gets established for a pariah group such as sex offenders, it is inevitable that there will be pressures to extend it to yet other groups and also to allow access to increasing numbers of individuals and institutions who claim that they have a "need" for the information contained therein.¹⁰⁸

"[T]he Director of the U.S. Office of Disease Prevention and Health Promotion, [Michael McGinnis], predicted that most people would have genetic profiles on record by the year 2000."¹⁰⁹ Even John Van DeKamp, the Attorney General of California, (one of the states which restricts DNA data banking to sex offenders) noted that to have fingerprints of persons with criminal histories easily accessible to tens of thousands of peace officers was one matter, but he cautioned that:

[i]t is quite another thing to have information on line that can mark you as a carrier of AIDS or prove that you are not genetically related to either of your parents. Which of us would like to know that we are genetically predisposed to a disease? Which of us would be willing to have such information easily available to others?¹¹⁰

¹⁰⁶ Thus, in much the same way individual fingerprints are routinely collected, so can individual genetic fingerprints be collected and "banked" along with the genetic information contained therein. See White & Greenwood, *supra* note 100, at 155. Indeed, there is "already a dangerous call from some government officials and DNA advocates to extend DNA testing to broad investigative data bank collections from population segments such as persons arrested but not convicted, government beneficiaries, employees, and the general populace." Westin, *supra* note 75, at 25. Clearly these should be rejected as invasive of privacy rights. *Id.*

¹⁰⁷ See *supra* notes 85-94, 96, & accompanying text.

¹⁰⁸ *DNA Hearing*, *supra* note 53, (statement of Prof. Philip L. Bereano, Engineering and Public Policy, University of Washington) [hereinafter *Bereano Testimony*]. At the recent New York legislative hearing, an FBI laboratory official suggested that "with a nationally standardized testing system, a DNA data file could be used to track criminals across districts or to identify bodies, missing children, or military personnel." *New York State Considers Legislating DNA Fingerprinting for Forensics*, 8 MCGRAW HILL'S BIOTECHNOLOGY NEWSWATCH, 8 (1988). But a state Assemblyman strongly objected to this idea: "[T]hey will analyze my cells at birth, and big brother will watch me for the rest of my life." *Id.*

¹⁰⁹ NELKIN & TANCREDI, *supra*, note 51, at 35. "Indeed, some biotechnology firms are predicting that most people will have their genetic profile on record by the year 2000." *Id.* at 159.

¹¹⁰ Address by John Van deKamp, Attorney General of California, California Criminalistics Seminar on DNA Identification 3, 4 (Jan. 7, 1988).

A great threat exists in our society by the creation of DNA data banks because the history of governmental protection of individual privacy and autonomy is inconsistent with the aims of a free and democratic society.¹¹¹ It is possible that the preferred form of identification will soon be a numerically expressed national standard DNA pattern of every individual which will be banked along with that individual's DNA profile in a national DNA computerized data bank.¹¹² "Perhaps it will replace the Social Security number that now (against Congress's original intention) serves that function."¹¹³

Examples of the government running amok in violation of the privacy of information collected for other purposes can easily be found. In the early thirties, when the original Social Security Act was passed, Congress provided that social security numbers should never be used for any other purpose than those envisaged in the Act.¹¹⁴ Congress assured the American people of this and further affirmed that confidentiality and privacy of the information would be fully protected.¹¹⁵ One hardly needs to comment on how this protection has been rigidly enforced.

In the name of efficiency and rationality, huge computer banks match our social security numbers to almost every phase of our life giving the government a permanent and complete warehouse of data on all our activities. For any employment application, for admission to any educational institution, for the issue of a driver's license by any state, and even for winning tickets at the race track or state lottery, you must furnish your handy social security number.¹¹⁶ Even more frightening is the wide-

¹¹¹ *DNA Hearing*, *supra* note 44, (statement of the American Civil Liberties Union, Wash., attached as addendum to *Bereano Testimony*, *supra* note 108).

¹¹² Marx, *DNA Fingerprints May One Day Be Our National ID Card*, Wall St. J., April 20, 1989 at A14.

¹¹³ *Id.* "Those who seek an immutable, unique identifier may look to a numerical reduction of an individual's genetic code, such as would be contained in the FBI's proposed investigatory databases, as a replacement for the SSN [social security number]." *Genetic Witness*, *supra* note 76, at 115.

¹¹⁴ Social security numbers were not intended to be the "universal identifiers" that they are today. Mayer, *Privacy and the Social Security Number: Section 1211 of the Tax Reform Act of 1976*, 6 J. COMPUTERS & L. 221, 223 (1978).

¹¹⁵ Social Security Act ch. 531, 49 Stat. 620 (1935) (current version at 42 U.S.C. Sec. 405 (1988)). Indeed, the social security number has "since been appropriated for use" as a national electronic identifier against Congress's original intention for its use as a mere accounting device for contributions to the social security system. *Genetic Witness*, *supra* note 76, at 115 (emphasis added).

¹¹⁶ Some of the public and private organizations which currently require a social security number as an identifier include:

the National Crime Information Center; the U.S. Department of Transportation's National Driver's Register; driver's licensing in most States; educational record keeping including student admissions; hunting or fishing licensing; credit checking; employee record keeping; obtaining a library card; giving blood; joining the Chamber of Commerce; enrolling in a health plan; and getting a telephone. All these uses are within the law, though certainly not anticipated when the social security system was devised.

Genetic Witness, *supra* note 76, at 115.

spread use of the social security number by private companies such as personal credit ratings agencies.¹¹⁷ Indeed, the identification number given to us at birth has become like a "leash around our necks, subjecting us to constant monitoring and making credible the fear of the fabled womb-to-tomb dossier."¹¹⁸

V. POTENTIAL PUBLIC AND PRIVATE SECTOR ABUSES

These critical privacy concerns are far from abstract. It can surely be expected that the next step of DNA testing will be that of individuals who are not criminals under the guise of socially desirable objectives.¹¹⁹ Once DNA analysis is seen as a familiar and benign crime control technique, the way may be paved for more controversial uses such as denial of insurance, employment, or even the right to have children because of an individual's genetic make-up.¹²⁰ The insurance industry, corporate

¹¹⁷ "If you are like 100,000,000 other Americans you began the process of losing your privacy the day you first opened a charge account, took out a loan, bought something on the installment plan or applied for a credit card." A. MILLER, *THE ASSAULT ON PRIVACY: COMPUTERS, DATA BANKS AND DOSSIERS* 67 (1971). Credit is a way of doing business that relies on probabilities which are calculated only after as much of an individual's personal and financial history has been uncovered as the credit bureau deems necessary to make its decision of whether to extend credit. *Id.* Genetic information contained in government or private data banks may one day be shared by businesses just as personal credit ratings are today. D. SUZUKI & P. KNUDTSON, *GENETHICS: THE CLASH BETWEEN THE NEW GENETICS AND HUMAN VALUES* 173 (1989).

¹¹⁸ Miller, *Computers Data Banks and Individual Privacy: An Overview*, 4 COLUM. HUMAN RIGHTS L. REV. 1, 3 (1972). As government and private agency computers become more compatible, a person's credit history, tax returns, medical records, educational transcripts and genetic information will be gathered from the various data banks and transferred to a single computerized data bank, thus creating a life-to-death dossier on every individual. Stephens, *High-Tech Crime Fighting: The Threat to Civil Liberties*, 24 THE FUTURIST, July-August 1990, at 20.

¹¹⁹ For example for "highly laudable social purposes—to identify amnesiacs, homicide victims, or disaster victims without identification, [and] missing children. . . ." Westin, *supra* note 66, at 33. See *supra* note 80 & accompanying text.

¹²⁰ Marx, *supra* note 112. In 1988 Dr. Paul Billings, a medical geneticist and Director of Harvard Medical School's Clinic for Inherited Disease, conducted a study regarding genetic discrimination as a consequence of genetic screening. Findings from Dr. Billing's study included: "[A]n asymptomatic person denied a job because he had CMT [Charcot Marie Tooth Disease], . . . [and one of the most startling findings] came from a young couple who had been advised by a genetics counselor to adopt a child because the wife's father had Huntington's disease; she herself only had a 50 percent chance of getting the disease and passing it on to her child." NELKIN & TANCREDI, *supra* note 51, at 166-67. The couple decided to adopt. However, when the adoption agency discovered the couple's reason for adoption, it refused their application because the woman "might become ill" in the future. *Id.*

employers, politicians, and government bureaucrats will be in the forefront pressing for such programs.¹²¹ As Professor Phillip L. Bereano predicted in his testimony before the Subcommittee on Civil and Constitutional Rights Committee on the Judiciary U.S. Representatives: "[W]hen the technology becomes cheap enough (by having expensive programs like police work absorb a lot of the front end costs), proposals will be made to do a DNA 'print' from every newborn baby's 'heel-stick' blood sample, just in case they should ever become amnesiac."¹²²

Indeed, government officials have proposed monitoring of an increasing number of so-called "pariah" groups in our society as a criminal investigative tool.¹²³ The computerized data banking of DNA will result in an unprecedented and extremely powerful means of governmental intrusion into a citizen's most private sanctuary, an individual's genetic make-up.¹²⁴ In a computerized society, if the government is allowed to control the recordation and preservation of human genetic data through the use of computerized DNA data banks (as is currently being proposed and is already taking place at an increasingly rapid rate throughout the country), the government will have a degree of power over the individual that is unprecedented and obviously subject to abuse.¹²⁵

¹²¹ As DNA samples are stored in computerized genetic banks, fear of genetic discrimination by employers, insurers, school systems, and other important institutions in our society becomes very rational. Reilly, *Reflections on the Use of DNA Forensic Science and Privacy Issues*, 32 BANBURY REPORT: DNA TECHNOLOGY AND FORENSIC SCIENCE 43 (1989). These same groups made widespread misuse of even such an unreliable test as the polygraph that it had to be severely restricted by Congressional Act. See Employee Polygraph Protection Act of 1988, Pub. L. No. 100-347, 102 Stat. 646 (1988).

¹²² Bereano Testimony, *supra* note 108, at 5. "Some researchers have called for genetic information to be gathered from all babies at birth. . . . [T]he high cost of conducting genetic tests now blocks any widespread collection of DNA fingerprints. But [Dr. Lander] predicted that the cost will drop within five years." Associated Press News Service Story, *supra* note 75, quoting *DNA Based Genetic Identification (Understanding the Double Helix): A Scientific and Legal Approach*, Session of the N.Y.S. 1990 Judicial Seminar held in Rochester, New York (July 1990) (comment of Dr. Eric S. Lander).

¹²³ These so-called pariah groups could include collection of DNA samples from all persons receiving public assistance (to control fraud and abuse of such programs) to all legal immigrants working in the United States, so that illegal aliens could be more effectively identified by the Immigration and Naturalization Service. Westin, *supra* note 75, at 33.

¹²⁴ SUZUKI & KNUDTSON, *supra* note 117, at 160-80.

¹²⁵ A data bank of DNA fingerprints will create a centrally computerized megabank of genetic information easily available for other purposes. White & Greenwood, *supra* note 100, at 155 n. 35 and accompanying text. DNA storage techniques allow DNA samples, containing all the genetic information on an individual, to be frozen indefinitely. "Computerized DNA 'banking' allows instantaneous retrieval of genetic information. . . . While the purpose [of the FBI DNA data bank] is limited to criminal investigations, stored DNA specimens collected for one purpose can be used for another unless the samples are destroyed." NELKIN & TANCREDI, *supra* note 51, at 159, 169.

Evidence has already been assembled of existing cases on discrimination based on genetic screening.¹²⁶ “[DNA] genetic screening can be defined as the examination of the genetic constitution of an individual—whether a fetus, a young child, or a mature adult—in search of clues to the likelihood that this person will develop or transmit a hereditary defect or disease.”¹²⁷ Currently, sophisticated laboratory techniques in molecular genetics can detect minute differences in DNA sequences.¹²⁸ This has made possible the screening of entire populations of job applicants and workers in an effort to identify individuals who might be especially susceptible to particular occupational hazards or illnesses.¹²⁹

“[S]implistic attempts to prejudge a worker’s ability to perform a job on the basis of his or her genetic constitution, or genotype, pose a serious threat to all of our rights.”¹³⁰ In the competitive world of business, one can quickly translate a predisposition of contracting a medical or behavioral illness into a denial of employment.¹³¹ But a mere statistical probability (not yet scientifically quantified) that a job applicant is genetically vulnerable to a particular occupational disease should not be considered grounds for denying work to that individual.¹³²

The United States government conducted a thorough review of genetic screening in the workplace, and amazingly uncovered evidence that over 75 of the nation’s largest firms had already instituted genetic screening programs, or planned to initiate occupational gene screening tests in the

¹²⁶ *Bereano Testimony*, *supra* note 108, at 9-10. However, evidence of the full extent of genetic discrimination is difficult to gather “because of negative feedback—people are unwilling to come forward [to give evidence] knowing that their self-identification is likely to prejudice them.” *Id.* at 10.

¹²⁷ SUZUKI & KNUDTSON, *supra* note 117, at 162.

¹²⁸ Advances in biological techniques have provided powerful instruments for genetic profiling which are used to predict medical and behavioral disorders that an individual might develop later in life. NELKIN & TANCREDI, *supra* note 51, at 159.

¹²⁹ SUZUKI & KNUDTSON, *supra* note 117, at 162. “History suggests that genetic testing—especially tests that purport to identify persons at enhanced risk for disease due to exposure to chemicals, but also tests that make general predictive statements about an individual’s risk of [contracting] a cancer or some other major killer—will be of great interest to employers.” Reilly, *supra* note 121, at 46.

¹³⁰ SUZUKI & KNUDTSON, *supra* note 117, at 161.

¹³¹ “In a survey of 400 U.S. firms conducted in 1989 by Northwestern National Life Insurance Company, 15 percent of companies responded that by the year 2000, they planned to check the health status of not only their prospective employees but their dependents as well before making a job offer.” Brownlee, *The Assurances of Genes: Is Disease Prediction a Boon or a Nightmare?*, U.S. NEWS & WORLD REPORT, July 23, 1990, at 57-58.

¹³² “The armed forces for many years have followed a policy of excluding the carriers of sickle cell disease, despite the fact that these individuals are not themselves impaired by their genetic situation.” *Bereano Testimony*, *supra* note 108, at 391. “Whole families are being stigmatized . . . [and] [i]ndividuals have been immobilized in current jobs, residence, and public or private programs, because any change would result in their inability to obtain insurance, even if they can continue under policies that they presently have.” *Id.* at 401.

near future.¹³³ These tests would obviously be used to exclude some individuals from employment and to determine job assignment for others.¹³⁴ Consequently, the issue of occupational genetic screening will be of increasing importance in the coming years.

Dr. Paul Billings, Director of the New England Deaconess Hospital and an expert on inherited disease, has made a preliminary report on his research into genetic discrimination as a consequence of genetic screening.¹³⁵ Dr. Billings concludes that a "new social class will be created by genetic screening, . . . his project has [already] found discrimination in employment (in both public and private sectors), access to social services (again in both the public and private sectors), insurability (including life, disability, health, and auto), and health care."¹³⁶

Will the insurance industry for example be allowed to use DNA testing to predict the health risks and therefore the insurability of clients? This may be contrary to public policy since one of the primary purposes of insurance is to spread the risk of loss among society as a whole. However, it would be extremely profitable for an insurance company to discriminate among applicants based on their DNA test results.¹³⁷ This discrimination would be based on a mere possibility not a probability.

There have already been many examples of insurance companies refusing to insure due to genetic screening as a consequence of DNA profiling analysis, despite the fact that the individuals were not impaired

¹³³ CUMMINGS, *supra* note 73, at 406. In the United States more than 80 percent of all large employers already review their workers' medical records. Beers, *The Gene Screen*, VOGUE, June, 1990, at 237, 278.

¹³⁴ CUMMINGS, *supra* note 73, at 406. Once society's understanding of genes in relation to disease increases, there will be great possibilities for discrimination on the basis of an individual's genetic makeup:

Once researchers identify a gene that induces Alzheimer's disease, alcoholism or coronary artery disease, for example, employers may want to test their employees (or applicants for employment) to detect those who are at risk for developing the disease. This country's history of employment discrimination against those with . . . epilepsy and cancer indicates the problems that may be faced by those with identifiable genetic predispositions for disease.

Orentlicher, *Genetic Screening by Employers*, 263 J. A.M.A. 1005 (1990).

¹³⁵ See *supra* note 120. Dr. Paul Billings' study regarding genetic discrimination found many individuals had been denied insurance and employment after they were diagnosed as predisposed to a genetic disease. NELKIN & TANCREDI, *supra* note 51, at 166.

¹³⁶ *Bereano Testimony*, *supra* note 100, at 401. Insurers have refused coverage on the basis of what policy holders *might* get, stated Dr. Paul Billings, director for the Clinic for Inherited Diseases at New England Deaconess Hospital in Boston. Tanne, *Mean Gene Tests: Harvard Documents Insurance Discrimination*, AMERICAN HEALTH, Dec. 1989, at 8. Dr. Billings pilot study suggests that insurers are practicing "genetic discrimination." *Id.*

¹³⁷ The competitive nature of the insurance industry may compel insurance companies to use genetic information. "[I]n order to assure a profit, insurers attempt to improve their actuarial odds by routinely excluding people with expensive diseases." Brownlee, *supra* note 131, at 57.

by their genetic situation.¹³⁸ Insurance companies have even refused to insure due to a pre-existing medical condition identified in the womb.¹³⁹ Society cannot realistically expect insurance companies and health maintenance organizations, motivated by profit and self-interest, not to attempt to obtain the information contained in the genetic profiles stored in data banks as a precondition of coverage.¹⁴⁰

Every human being should be granted a measure of fundamental privacy in important medical matters involving that most personal of sanc-

¹³⁸ Ignorance concerning genetic conditions is widespread both among insurance carriers and employers. A recent article in *The New York Times* aptly sums up the problem: "Most people think genes are destiny [stated Dr. Robert Murray, head of genetics at Howard University Medical School in Washington] and have no understanding of one of the most common genetic 'conditions,' known as carrier status. Carriers are people who have a defective gene but who are unaffected by the disease it conveys." Blakeslee, *Ethicists See Omens of an Era of Genetic Bias*, *N.Y. Times*, Dec. 27, 1990, at B1. See *supra* note 111. Dr. Paul Billings' study found many examples of insurance companies refusing to insure such "carriers" or individuals with genetic predisposition to disease:

A man with an excellent driving record could not renew his automobile insurance when the company found out he had a neurological disorder, Charcot Marie Tooth Disease (CMT), though the disease had been stable and non-progressive for twenty years. An eight year old girl, who had been diagnosed at birth as having [Phenylketonuria] PKU, was ineligible for insurance under a group plan, though with proper diet she had developed into a normal and healthy child. A young man diagnosed as hemochromatotic (excessive iron), but stabilized for many years through a regimen of phlebotomies (blood letting) was denied life insurance, though his parents, similarly afflicted, had lived into their eighties.

NELKIN & TANCREDI, *supra* note 51, at 166. "Genetic tests will tempt insurers to discriminate against 'the healthy ill'—people who are not yet sick but who carry genetic traits predisposing them to future illness." Brownlee, *supra* note 131, at 57.

¹³⁹ At a medical center in the Southwest, through amniocentesis a pregnant woman's fetus tested positive for cystic fibrosis, and the insurance company, a health maintenance organization that had agreed to pay for the test (which usually is not covered), refused medical coverage to the infant. The health maintenance organization's message was clear: either abort the defective baby or struggle alone with the financial burden of a sick child who undoubtedly would require extensive care for the rest of its life. The parents decided to have the baby, who was, as clearly expected, born with cystic fibrosis. Under pressure of a lawsuit the health maintenance organization extended medical coverage to the infant. *The Price of Knowledge: Genetic Tests That Predict Dire Conditions Become a Two-Edged Sword*, *supra* note 61, at 27. The community of medical geneticists fear that such problems will become increasingly widespread as more gene screening tests become readily available. *Id.* See also Tanne, *supra* note 136, at 8.

¹⁴⁰ For example, "[a]s physicians [use] genetic tests for diagnosis, their patients most intimate genetic details will almost certainly become available to insurers." Brownlee, *supra* note 131, at 58. "Although doctors cannot divulge medical records without a patient's consent, insurance companies regularly gain permission to look them over in order to process claims. In addition, the medical records of people who apply for insurance are stored by the Medical Information Bureau, a data bank shared by a consortium of hundreds of insurers." *Id.* at 58-59.

tuaries—the human genome.¹⁴¹ Information about an individual's genetic constitution should be limited to aiding an individual's personal decisions and actions, rather than to furnish the basis of discrimination in the public or private sector.

If the genes of babies can be screened, and it can be determined that the individual is predisposed to die of a heart attack in his or her forties, it will obviously follow that the public and private sector will wish to use this information to determine whether society should invest in their education, and once employed whether they should be promoted to the upper echelons of management.¹⁴² Therefore, society could have a new form of discrimination based on an individual's genetic make-up which would affect everything from education, to employment, to even who a person selects to marry.¹⁴³

Now is the appropriate time for society to face the serious moral dilemmas surrounding the use of DNA genetic profiling. DNA typing has potential too great, too hazardous, and too dire to ignore the profound questions which it raises. These societal answers require economic and legal reassessments of the fundamental rights of the individual versus those of society.

VI. LEGISLATION IS ESSENTIAL

As Daniel Koshland, editor of *Science* magazine warned: "No one should be forced to have a DNA sequence taken for anything other than [identification]. We [as a society] are willing to accept the inefficiency of a person who falls by the wayside. That is part of the dignity of man."¹⁴⁴

Unique and serious civil libertarian concerns are raised when the involuntary analysis of DNA is proposed to create a data bank, or library of information, for the purpose of identifying and investigating individuals as potential criminal suspects.¹⁴⁵ Claims of governmental efficiency

¹⁴¹ SUZUKI & KNUDTSON, *supra* note 117, at 162. A current attempt to effectuate such a policy is the Americans with Disabilities Act of 1990, Pub. L. No. 101-336 Sec. 102 (c). For comments and criticism the possible effect of this provision see Orentlicher, *supra* note 134, at 1005; Beers, *supra* note 133, at 278.

¹⁴² It may be difficult to detect improper uses of genetic test results in employment decisions once an applicant has already been hired, such as changes in salary or job assignment. Orentlicher, *supra* note 134, at 1005.

¹⁴³ For example, a new genetic test can detect three-quarters of all adults who risk having children born with cystic fibrosis. "One of every 25 Americans carries one copy of the cystic fibrosis gene. The carriers are healthy, but if they marry another carrier there is a 1-in-4 chance that their children will have cystic fibrosis." N.Y. Times, Feb. 2, 1990, at A20, col. 6.

¹⁴⁴ *The Price of Knowledge: Genetic Tests That Predict Dire Conditions Become a Two-Edged Sword*, *supra* note 61, at 27.

¹⁴⁵ Indeed, even the father of genetic fingerprinting, Professor Alec Jeffreys of Leicester University, strenuously objected to compulsory registers of genetic fingerprints. Conner, *supra* note 67, at 3. Professor Jeffreys responded to such a proposal extremely negatively by stating that a technique of compulsory genetic data banking "fills me with profound horror. It assumes that all men are rapists. Furthermore, it wouldn't work. Any such scheme has got to be voluntary." *Id.*

in the war against crime and drugs must not be allowed to justify every demand for data banking DNA, especially since the government has not instituted any firm guidelines as to how the government plans to protect society against the great potential abuse of the computerized DNA data banks.¹⁴⁶

It is a certainty that the information stored in these DNA data banks will circulate.¹⁴⁷ A chilling foretaste of what is to come in the very near future, unless remedial action is taken, is the startling change of position of the National Crime Information Center (NCIC) Advisory Policy Board. "Although in December 1987 the NCIC Advisory Policy Board voted not to add DNA information to NCIC at that time, DNA testing and acceptance by law enforcement has spread rapidly since then. In June 1989, the Board reconsidered its actions, voting to index and match DNA profiles in NCIC."¹⁴⁸ "In our information oriented society, personal data about individuals is [extremely] valuable, especially if it is derogatory."¹⁴⁹ Governmental agencies and institutions will certainly use it, as they already have used so-called protected tax and social security information. Educational institutions, credit grantors, employers, and insurance companies, will pay for it as they have on occasion or even steal it.¹⁵⁰ The Director

¹⁴⁶ The recent bill regarding DNA profiling and data banking passed by the New York State Legislature for example is great on rhetoric, but poor on specifics because a committee is deemed to have the power to protect the privacy of the DNA data, yet no specific guidelines are enumerated. *N.Y.S. Bill 11073, supra*, note 68. Even though this recent New York State bill forcefully recognizes the threat of DNA data banking to "one of the most fundamental spheres of privacy in a democracy; a citizen's genetic make-up," it does not resolve this crucial issue of privacy protection of DNA data banking since it completely delegates to its DNA advisory committee the essential task of "establishing the highest standard of reliability and . . . the most rigorous privacy protection." *Id.* at 6.

¹⁴⁷ The blatant reality of this situation is exemplified by a recent case where the principal owner of the New York Yankees, George Steinbrenner, drawing on a 20-year working relationship with the FBI, often enlisted past and present agents of the bureau's Tampa office to conduct unofficial background checks of business associates as well as his own employees according to former Tampa FBI agents. Pitt, *Tampa FBI Is Said to Have Helped Steinbrenner*, *N.Y. Times*, Aug. 10, 1990, at A1, col. 2. The article stated:

[T]he use of the National Crime Information Center's computer for other than law enforcement purposes was a misdemeanor under Federal law. Although he could recall no specific prosecutions, Mr. Kortan said that *such misuse was undoubtedly quite common since more than 50,000 local law enforcement agencies had direct access to the computer files*, which are routinely used, for example, to check whether motorists stopped for traffic violations have criminal records or outstanding warrants.

Id. at A19, col. 1; *N.Y. Times*, Aug. 14, 1990, at B11. (emphasis added).

¹⁴⁸ *Genetic Witness, supra* note 76, at 20. This is the same National Crime Information Center (NCIC) computerized data bank which Mr. Kortan referred to when he discussed widespread misuse and access. See *supra* note 147 & accompanying text.

¹⁴⁹ Miller, *supra* note 118, at 10.

¹⁵⁰ "[I]n New York . . . a number of consumer reporting agencies were prosecuted for bribing New York policemen to reveal the content of fingerprint and arrest records to them." Miller, *supra* note 118, at 10.

of the Federal Bureau of Investigation, Judge William Sessions recently solemnly declared, "there is a very, very careful guarding of the evidence by the FBI always in every case, as with FBI fingerprinting identification, those things are . . . very carefully kept."¹⁵¹ However, as Ted Koppel observed during that same Nightline interview: "There is a truism in Washington that if it exists somewhere in a government file, eventually it is going to leak."¹⁵² The concept of personal privacy must be fundamental to our democratic tradition of individual autonomy.

Indeed, the data banking of such information which is so highly personal in character and potentially embarrassing or harmful if disclosed could well be called into question as violative of the Fourth Amendment.¹⁵³ In the Supreme Court case, *Whalen v. Roe*,¹⁵⁴ where similar computer data banking was involved, the majority of the court recognized "the threat to privacy implicit in the accumulation of vast amounts of personal information in computerized data banks . . .".¹⁵⁵ "The right to collect and use such data for public purposes is typically accompanied by a concomitant statutory or regulatory duty to avoid unwarranted disclosures."¹⁵⁶ As Justice William Brennan so eloquently warned in his concurring opinion in *Whalen v. Roe*:¹⁵⁷

Broad dissemination by state officials of such information, however, would clearly implicate constitutionally protected privacy rights. . . . What is [most] troubling about this scheme, however, is the central computer storage of the data thus collected. Obviously as the State argues, collection and storage of data by the State that is itself legitimate is not rendered unconstitutional simply because new technology makes the state's operations more efficient.¹⁵⁸

Then, Justice Brennan made the cogent observation that escalating compilations of, and unfettered dissemination of such information will implicate privacy rights:

¹⁵¹ *Nightline*, *supra* note 71, at 6. Obviously, Judge Sessions does not read the sports pages of the New York Times or keep current with the travails of George Steinbrenner, or even more ominously with the misuse of the National Crime Information Center computer bank which is a system maintained by the FBI. See *supra* notes 147, 148 & accompanying text.

¹⁵² *Nightline*, *supra* note 71, at 6.

¹⁵³ *Whalen*, *Comm'r of Health v. Roe*, 429 U.S. 589, 605 (1977).

¹⁵⁴ *Id.*

¹⁵⁵ 429 U.S. at 605-06. See also Boyer, *Computerized Medical Records and the Right to Privacy: The Emerging Federal Response*, 25 BUFFALO L. REV. 37 (1975); Miller, *supra* note 118. The United States Supreme Court upheld the New York Statute providing for computerized data banking of certain prescription drug patients' names and addresses because "[i]t [was] manifestly the product of an orderly and rational legislative decision . . . a reasonable exercise of New York's broad police powers." 429 U.S. at 597-98.

¹⁵⁶ 429 U.S. at 605.

¹⁵⁷ 429 U.S. 589 (1977)

¹⁵⁸ 429 U.S. at 606 (Brennan, J. concurring).

[]The example of the Fourth Amendment shows, the Constitution puts limits not only on the type of information the state may gather, but also on the means it may use to gather it. The central storage and easy accessibility of computerized data vastly increase the potential for abuse of that information, and I am not prepared to say that future developments will not demonstrate the necessity of some curb on such technology.¹⁵⁹

VII. CONCLUSION

It is obvious that DNA is not merely a fingerprint. It is a genetic profile. Certainly, it has great utility for identity purposes in criminal matters, but it can also be used for much more.

As this is a national problem, society must look to Congress, but in the interim, state legislation is needed. The very use of DNA should be limited only to those situations where the public has a vested interest, such as in crime, or where the information is used for medical research or treatment.

A necessary requirement must be that informed consent be obtained as a precondition for the testing to be conducted, unless there is a valid court order authorizing it. In criminal or civil matters a court order based on probable cause must be required for obtaining genetic information for identification purposes. For other such uses as obtaining and maintaining employment, insurance, and education, DNA testing as a precondition must be made unlawful.

Any governmental agency, medical facility or laboratory which obtains DNA data as allowed under the statute, must be required to keep such information confidential, except for the uses enumerated in the statute. Unauthorized access to any DNA profiles or any improper communications must be made a felony.

Unless the genetic information retained can be proven scientifically beyond a reasonable doubt to have no other significance than identification, data banking itself, of so called genetic fingerprinting, must be prohibited .

Society cannot accept less than these necessary standards no matter how strenuously the law enforcement community argues for the use of DNA data banking. Indeed, if we are to believe that the data banking of genetic profiles with all its inherent potential for abuse is to be treated with all the sanctity and careful precautions for privacy with which the data banking of fingerprints are now treated, the illusion of that protection is self-evident and the need for remedial legislation is upon us.

¹⁵⁹ 429 U.S. at 606-07 (Brennan, J. concurring).