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Criminal Law - The Admission of Polymerase Chain Reaction DNA Evidence in New Mexico Courts - State v. Stills

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CRIMINAL LAW—The Admission of Polymerase Chain Reaction DNA Evidence in New Mexico Courts—*State v. Stills*

I. INTRODUCTION

In *State v. Stills*,[1] the New Mexico Supreme Court held that the polymerase chain reaction (PCR) method of DNA analysis is admissible in New Mexico courts. PCR DNA analysis is one method by which parties can identify or exclude an individual as a suspect in a criminal investigation or trial. DNA identification has been utilized since the mid-1980s and is frequently used in criminal trials around the country.[2] However, the PCR method is a relatively new process and many question its validity. The New Mexico Supreme Court had previously held that the more comprehensive and more widely accepted restriction fragment length polymorphism (RFLP) method of analysis was admissible in New Mexico courts.[3] *Stills* is the first case to come before the court on the question of PCR evidence.

PCR is increasingly popular because of its practical advantages over RFLP. The PCR method requires only a minute sample of DNA, whereas the RFLP method requires a more substantial sample.[4] Moreover, the PCR analysis takes much less time to complete and does not require recently collected samples in order to be effective.[5] However, many question the reliability of PCR evidence because of its vulnerability to contamination.[6] Critics also suggest that the population principles upon which scientists analyze PCR results can lead to incorrect results, particularly within minority groups such as Latinos.[7] In a state where Latinos make up a substantial portion of the population, this should be cause for concern. Despite its detractors, PCR is widely accepted as an effective forensic tool. The *Stills* decision will have a profound effect on the way that police, prosecutors, and defense attorneys look at crime scenes. Eyelashes, skin flakes, and invisible drops of blood may now become the foundation upon which cases are built and destroyed.

This article analyzes the advantages and disadvantages of allowing PCR analysis and critiques the notion that any and all PCR evidence should be admitted *carte blanche*. Section II of this article presents the facts and procedural history of *Stills*. Section III discusses the case law regarding DNA analysis in both New Mexico and other jurisdictions before *Stills*. Section IV briefly describes the technical process by which laboratories analyze DNA under both the RFLP and PCR methods. Section V articulates the court's rationale in deciding that PCR should be admissible in New Mexico. Section VI analyzes the restrictions that *Stills* places on judges in their role as evidentiary gatekeeper. Section VII discusses the possible implications of allowing PCR results for both prosecutors and defense attorneys as well as any retroactive effect it may have on pre-*Stills* criminal convictions.

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1. 125 N.M. 66, 78, 957 P.2d 51, 63 (1998).
2. *See* George Bundy Smith & Janet A. Gordon, *The Admission of DNA Evidence in State and Federal Courts*, 65 FORDHAM L. REV. 2465, 2470 (1997).
3. *See Stills*, 125 N.M. at 72, 957 P.2d at 57 (citing State v. Anderson, 118 N.M. 284, 881 P.2d 29 (1994)).
4. *See* Smith & Gordon, *supra* note 2, at 2470.
5. *See id.* at 2471.
6. *See id.*
7. *See id.* at 2476.

II. FACTS AND PROCEDURAL HISTORY

Anthony Stills was convicted of, among other things, felony murder and first degree sexual penetration in the death of his step-daughter, Hollie Karr.[8] On April 19, 1993, the victim was found dead in her home.[9] She had been raped, beaten, and strangled. Although Stills professed his innocence, police noticed that the defendant's right hand was swollen and cut. He claimed that he had punched a wall in grief, but a witness would later testify that Stills admitted beating the girl. The crime scene had been painstakingly cleaned thus making it difficult for police to obtain any substantial DNA samples. Thanks to an anonymous tip, police discovered bloody gloves at a nearby intersection. Missing fingertips from the gloves matched a bloody piece of vinyl found at the crime scene. A box of the same type of gloves was found at the crime scene with one pair missing.

The gloves were subjected to the RFLP method of DNA analysis. The RFLP analysis determined, from the amount of DNA evidence available, that the blood on the glove was consistent with the victim's blood.[10] The gloves were then subjected to the PCR method of DNA analysis. The PCR analysis determined that the blood on the glove was consistent with both the blood of the victim and the blood of the defendant. The defendant filed a pre-trial motion to exclude the PCR analysis, claiming that PCR evidence had not been held reliable or gained general acceptance in the scientific community and was thus inadmissible. The defendant argued that to introduce such evidence would be unfairly prejudicial. At the hearing, several forensic experts testified to the validity of PCR testing, the integrity of the commercial laboratory which conducted the test, the integrity of the protocol used by that laboratory, and the possible effects of improper collection upon the samples. The trial court denied the defendant's motion to dismiss the evidence. Stills was convicted and appealed, claiming that the trial court abused its discretion in allowing the PCR results to be introduced.[11] Stills argued that the PCR technique and results did not meet the threshold admissibility standard set by the court in *State v. Anderson,*[12] the first New Mexico case in which DNA evidence was admitted.

III. THE HISTORY OF DNA EVIDENCE IN NEW MEXICO COURTS AND OTHER JURISDICTIONS

The admission of scientific evidence, such as DNA analysis, is frequently held to a different standard than other types of evidence. Jurisdictions across the country are split on how novel types of scientific evidence should be scrutinized before they

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8. *See Stills*, 125 N.M. at 69, 957 P.2d at 54 (Anthony Stills was convicted of felony murder, child abuse, criminal sexual penetration in the first degree, kidnapping, and two counts of tampering with evidence).

9. For all facts regarding the case, see *id.* at 69-71, 957 P.2d 54-56.

10. *See id.* at 70, 957 P.2d at 55 ("The testimony at trial was that the probability that a randomly-chosen individual would have the same DNA profile as the blood found on the glove samples analyzed by the RFLP technique is 1 in greater than 5.5 billion.")

11. Stills also claimed that the trial court improperly refused to instruct the jury on voluntary manslaughter, he was deprived of a proper defense by the trial court's limitations on expert testimony, physical evidence was improperly introduced, prosecutorial misconduct, cumulative error, insufficient substantive evidence to suggest conviction beyond a reasonable doubt, and ineffective assistance of counsel. *See id.* at 54.

12. 118 N.M. 284, 291, 881 P.2d 29, 36 (1994).

are presented to a jury. Scientific evidence anointed with the approval of the court carries with it an implicit integrity. Some argue its mere presence can be outcome determinative. Therefore, courts weigh heavily the decision to admit novel scientific procedures, such as newly developed methods of DNA analysis. To understand how New Mexico approaches the problems presented by novel technologies, it is important to understand the history of novel scientific evidence in general because much of New Mexico's policies are based upon that history.

A. *In the Beginning, There was* Frye

Frye v. United States[13] was the first case in which a court decided that novel scientific evidence should be treated differently than other evidence.[14] The court held that such evidence should be admissible only if the theory upon which it is based has "gained general acceptance in the particular field in which it belongs."[15] This test required "only that the judge defer to the opinions of scientists, so long as those opinions were consistent with conventional scientific wisdom."[16] *Frye*'s "general acceptance" test relies on the premise that the scientific community, as opposed to individual judges, should gauge the validity of novel technologies. This test prevents judges from trying to understand every new technique by allowing them to survey the scientific community in order to determine its acceptance. *Frye* became the dominant test for the admissibility of novel scientific evidence in both federal and state courts. New Mexico courts adopted this standard in *State v. Trimble*.[17] One of the primary criticisms of *Frye* was that it required judges to relinquish the role of evidentiary gatekeeper where novel scientific techniques were involved.[18]

Critics began to further question the rigid *Frye* test in 1975 with the adoption of the more flexible Federal Rules of Evidence.[19] Rule 104(a) assigned judges the responsibility of making a preliminary determination on whether to allow a given expert to testify.[20] Rule 702 requires a judge to determine whether the admission of such testimony will assist the trier of fact to understand evidence or determine a fact at issue.[21] Rule 403 suggests that a trial judge may exclude evidence if its likely prejudicial effect substantially outweighs its probative value.[22] The New Mexico

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13. 293 F. 1013, 1014 (D.C. Cir. 1923).

14. *See* MCCORMICK ON EVIDENCE § 203, at 869 (John William Strong ed., 4th ed. 1992).

15. *See Frye*, 293 F. at 1014 (holding that a precursor to polygraph tests was inadmissible because the scientific principles upon which the procedure was based were not "sufficiently established to have gained general acceptance in the paraticular field in which it belongs.")

16. Anne M. Gaeta & Elizabeth A. Sitnick, *Reliability and Admissibility Under Daubert, in* THE JUDGE'S ROLE AS GATEKEEPER: RESPONSIBILITIES AND POWERS 36 (Daubert Project, Berkman Center for Internet & Society, Harvard Law School, 1998).

17. 68 N.M. 406, 362 P.2d 788 (1961).

18. *See* Note, *Improving Judicial Gatekeeping: Technical Advisors and Scientific Evidence*, 110 HARV. L. REV. 941, 943 (1997) (citing Bert Black, *A Unified Theory of Scientific Evidence*, 56 FORDHAM L. REV. 595, 632 (1988)).

19. *See* Smith & Gordon, *supra* note 2, at 2479; *see also* Gaeta & Sitnick, *supra* note 16, at 37; Erica Beecher-Monas, *Blinded by Science: How Judges Avoid the Science in Scientific Evidence*, 71 TEMP. L. REV. 55, 60-61 (1998) (discussing the effects of the Federal Rules of Evidence on the *Frye* admissibility standard).

20. *See* FED. R. EVID. 104(a).

21. *See* FED. R. EVID. 702.

22. *See* FED. R. EVID. 403.

Rules of Evidence mirrored the federal rules.[23] These rules articulate a more discretionary standard than the *Frye* test.[24] However, some critics argued that the increased use of expert testimony and scientific evidence throughout the 1980s under the Federal Rules of Evidence led to increasingly lax standards regulating the admissibility of expert testimony and scientific evidence.[25] Therefore, states were split on whether they should retain the strict *Frye* test or adopt the new policy articulated under Federal Rules of Evidence. Of primary importance was the role the judge would play and how much discretion the judge would be allowed.

B. Daubert *Cleared Up Everything, Didn't It?*

In *Daubert v. Merrell Dow Phamaceuticals, Inc.*,[26] the Supreme Court attempted to clarify the judge's discretionary role under the Federal Rules of Evidence. The Court concluded that the Federal Rules of Evidence superseded the *Frye* test in federal cases.[27] The Court imposed a gatekeeping duty under which judges must now make their own assessment of the reliability of proffered evidence. In doing so, the Court enumerated a new standard to instruct judges on their role as evidentiary gatekeepers. This new standard incorporated the "general acceptance" test but required courts to look at other factors in determining the reliability of scientific evidence such as the relevancy of the evidence and its testability.[28] The effect of *Daubert* was to allow more flexibility in the admission of scientific evidence while maintaining the "general acceptance" element of Frye. "[T]he Supreme Court at one and the same time liberalized the standards of admissibility and enhanced the constraining power of trial judges to exclude unreliable expert testimony."[29] The Court offered suggestions as to how judges might better fulfill their enhanced gatekeeping duties. One suggestion was that courts appoint their own experts under Rule 706 of the Federal Rules of Evidence.[30]

The New Mexico Supreme Court embraced the *Daubert* test in *State v. Alberico*.[31] In *Alberico*, the court rejected the *Frye* test as an independent controlling standard of admissibility, and in doing so, agreed that "a particular degree of acceptance of a scientific technique within the scientific community is

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23. *See* N.M. R. EVID. 11-104(a), -702, and -403 (1999).

24. *See* General Electric Co. v. Joiner, 78 F.3d 524, 529 (11th Cir. 1996) ("[T]he Federal Rules of Evidence allow district courts to admit a somewhat broader range of scientific testimony than would have been admissible under *Frye* . . . .").

25. *See* Gaeta & Sitnick, *supra* note 16, at 37 (citing PETER W. HUBER, GALILEO'S REVENGE: JUNK SCIENCE IN THE COURTROOM 16 (1991) ("Today virtually any doctor armed with a medical degree can testify . . . . He need not establish that his diagnostic methods or logical leaps enjoy 'general acceptance' among doctors. Quite the contrary: he may insist that he alone understands the importance or origins of certain symptoms.").

26. 509 U.S. 579 (1993).

27. *See id.*

28. *See* Daniel S. Fridman & J.Scott Janoe, *The State of Judicial Gatekeeping, in New Mexico, in* THE JUDGE'S ROLE AS GATEKEEPER: RESPONSIBILITIES AND POWERS (The Daubert Project, Berkman Center for Internet & Society, Harvard Law School, 1998).

29. *See* Gaeta & Sitnick, *supra* note 16, at 41.

30. *See Daubert*, 509 U.S. at 595.

31. 116 N.M. 156, 861 P.2d 192 (1993). *See also* Fridman & Janoe, *supra* note 28, at 10 ("In *State v. Alberico* the Supreme Court of New Mexico unequivocally abandoned the *Frye* test in favor of a modern rule-based approach to admissibility similar to the federal courts' practice under the Federal Rules of Evidence and *Daubert*.").

neither a necessary nor a sufficient condition for admissibility; it is, however, one factor that a district court normally should consider in deciding whether to admit evidence based upon the technique."[32] Like the United States Supreme Court, the New Mexico Supreme Court added general acceptance as one of three criteria for lower courts to consider when determining the admissibility of novel scientific evidence.

C. *DNA Evidence in Other Jurisdictions*

DNA evidence has been used in other jurisdictions since the mid-1980s.[33] However, standards of admissibility vary widely from restrictive to discretionary. Some states, like Massachusetts,[34] accept all forms of DNA testing without question, while others, like California, accept only the most accurate of tests.[35] Both the Arizona and Nebraska supreme courts have rejected PCR evidence outright.[36] In Nebraska, the court held that, "the PCR system's statistical probability results are not expressed in the exceptionally high numbers that essentially fingerprint the defendant."[37] Other states have adopted PCR evidence following neither the *Frye* nor the *Daubert* test. In Tennessee, the legislature, not the court, adopted the PCR method by statute.[38] Because of the wide array of standards in force, there was no clear approach or model from which New Mexico could draw a definitive policy. However, New Mexico had traditionally adopted a more liberal evidentiary policy and *Stills* would be no different.

D. *DNA Evidence in New Mexico under* Anderson

In *Stills*, the New Mexico Supreme Court primarily relied upon its holding in *State v. Anderson* to determine whether PCR evidence should be admissible in New Mexico courts.[39] In *Anderson*, the court held that RFLP evidence is admissible in New Mexico and that "questions concerning the test results or statistical probabilities go to the weight of the evidence and are the concern of the fact finder."[40] The court held that, under Rule 702 of the New Mexico Rules of Evidence, the trial court is required to apply a three-part test to determine whether DNA evidence is admissible.[41] "First, the expert must be qualified; second, the testimony must assist the trier of fact, it must be relevant; and, third, the evidence

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32. *See Alberico*, 116 N.M. at 167 (citing United States v. Downing, 753 F.2d 1224, 1237 (3rd Cir. 1985)).

33. *See* Smith & Gordon, *supra* note 2, at 2479.

34. *See* Commonwealth v. Rosier, 685 N.E.2d 739 (Mass. 1997) (noting that in Massachusetts, courts have admitted RFLP, PCR, and a new type of DNA analysis known as short tandem repeat).

35. *See The Gene School: Courtroom Admissibility* (visited Nov. 15, 1998) <http://library.advanced.org/19037/court3.html>; *see also* People v. Wright, 72 Cal. Rptr. 2d 246 (Cal. Ct. App. 1998).

36. *See* John Gibeaut, *Ruling Every Which Way*, 84 A.B.A.J. 40 (1998).

37. State v. Carter, 524 N.W.2d 763 (Neb. 1994).

38. *See* State v. Begley, 956 S.W.2d 471 (Tenn. 1997).

39. *See Stills*, 125 N.M. at 72, 957 P.2d at 57.

40. *See id.* (citing *Anderson*, 118 N.M. at 303, 881 P.2d at 48).

41. *See* N.M. R. EVID. 11-702 (1999) ("If scientific, technical or other special knowledge will assist the trier of fact to understand the evidence or to determine a fact in issue, a witness qualified as an expert by knowledge, skill, experience or education may testify thereto in the form of an opinion or otherwise.").

must be reliable."[42] The substantive portion of Stills' appeal argued that the third part of the test had not been met, that the PCR test results were not reliable.

Regarding the reliability prong of the *Anderson* test, the New Mexico Supreme Court, primarily relying upon *Daubert*,[43] considered four factors to determine whether DNA evidence is reliable. First, the court must look at whether the technique of DNA analysis can be (and has been) tested.[44] Second, the court looks at whether the technique of DNA analysis has been subjected to peer review and publication.[45] Third, the court must consider "the known potential rate of error" in using a specific method of DNA analysis "and the existence and maintenance of standards controlling the technique's operation."[46] Fourth, the court must consider whether the technique of DNA analysis has been generally accepted in that particular scientific field.[47] To determine whether PCR evidence met these standards, the New Mexico Supreme Court required an understanding of the procedures involved.

IV. TECHNICAL BACKGROUND

Deoxyribonucleic acid (DNA) is the chemical dispatcher for genetic information found in almost every cell of the human body.[48] A human being's genetic make-up consists of approximately three billion chemical combinations.[49] Most of these combinations are necessarily identical to other human beings as part of a general schematic for the species (e.g., ten fingers, two arms, etc.). Three million of these combinations differ from individual to individual (e.g., genes for eye color, blood type, etc.).[50] "It is the existence of these minor differences . . ., known as 'polymorphisms,' [or alleles] that provide the basis for DNA identification and have a great significance for DNA forensic analysis."[51] Because of the wide variance in possible combinations, the likelihood that any two individuals have the same DNA configuration is extremely remote.[52] Consequently, forensic scientists often use DNA identification tests to compare samples of DNA taken from criminal suspects to unknown samples taken from a crime scene to determine the statistical likelihood that the unknown sample comes from the suspect.[53]

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42. *Stills*, 125 N.M. at 72, 957 P.2d at 57 (citing *Anderson*, 118 N.M. at 291, 881 P.2d at 36).
43. 509 U.S. at 580.
44. *See Anderson*, 118 N.M. at 291, 881 P.2d at 36.
45. *See id.*
46. *See id.* (quoting *Daubert*, 509 U.S. at 580).
47. *See id.*
48. *See* Smith & Gordon, *supra* note 2, at 2465.
49. *See id.* at 2466.
50. *See* NATIONAL RESEARCH COUNCIL, DNA TECHNOLOGY IN FORENSIC SCIENCES 34-35 (1992) [hereinafter "NRC I"].
51. Smith & Gordon, *supra* note 2, at 2467.
52. *See id.* at 2465.
53. *See* David H. Kaye, *DNA, NAS, NRC, DAB, RFLP, PCR, and More: An Introduction to the Symposium on the 1996 NRC Report on Forensic DNA Evidence*, 37 JURIMETRICS J. 395 (1997).

A. *Methodology*

The RFLP technique adopted under *Anderson* is the most widely used and accepted method of DNA analysis.[54] The PCR method has only been developed recently but is gaining acceptance across the country. Both processes are based upon similar principles but employ different techniques in extracting the genetic information from any given sample.

1. RFLP

The RFLP tests currently used by the FBI and the major commercial laboratories simply transforms one DNA sample into a bar code which can be visibly compared to that of the another to determine whether both samples came from the same source.[55] Using enzymes, DNA is extracted from both the suspect and the unknown sample, usually blood or semen. The DNA is then cut into fragments of specific genetic sequences.[56] These fragments are placed in an agarose gel and electronically polarized, causing the genetic material to literally move across the gel.[57] The length of movement varies with each allele.[58]

The samples are then transferred from the gel onto a nylon membrane where they become permanently fixed according to how far they have moved.[59] This nylon membrane, also known as a "Southern Blot," allows strands to be marked with radioactive probes to create something similar to a photographic negative.[60] The negative is then placed against a radioactive film and processed. The resulting "DNA print" contains dark bands resembling bar codes, which are examined to determine the length of specific fragments.[61] The lengths of the different "bar codes" from the two samples are compared, using computer assisted imaging devices, to determine whether there is a match. Statistical analysis of that match allows experts to determine whether or not the sample can exclude someone as a suspect.

2. PCR method

The PCR method of analysis uses a similar process but can do so with a much smaller sample of DNA.[62] The "PCR analysis takes advantage of the reproductive nature of DNA, and allows a forensic scientist to produce multiple copies from a single test sample of DNA in a process similar to the one by which DNA duplicates itself normally."[63] Small portions of DNA are placed in a test tube along with the

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54. *See* Gibeaut, *supra* note 36 at 40; *see also* Smith & Gordon, *supra* note 2, at 2468 (discussing the wide acceptance of RFLP evidence).

55. *See* Smith & Gordon, *supra* note 2, at 2468 (citing People v. Wesley, 633 N.E.2d 451, 459-61 (N.Y. 1994) (outlining the procedure for RFLP analysis)).

56. *See id.* at 2469 (citing LANSING M. PRESCOTT ET AL., MICROBIOLOGY 193-201, 236-307 (2d ed. 1993) (explaining the structure and characteristics of DNA)).

57. *See id.*

58. *See id.*

59. *See id.*

60. *See id.* at 2470.

61. *See id.*

62. *See* Commonwealth v. Sok, 683 N.E.2d 671, 674 (Mass. 1997).

63. Smith & Gordon, *supra* note 2, at 2470.

volumes of the four bases that make up DNA: adenine (A), thymine (T), guanine (G), and cytosine (C). The DNA is heated until the DNA is broken into two separate parts. Short stretches of man-made ATCG sequences bind to the broken halves allowing the DNA to regenerate.[64] The replication process produces two copies of the DNA and may be repeated as often as necessary. The process usually takes less than twenty-four hours and, unlike the RFLP method, does not require radioactive materials.[65] In addition, the PCR method can use more degraded samples, whereas the RFLP method requires fresh samples.[66]

Although the PCR method has many practical advantages, it is widely criticized for its vulnerability to contamination. The synthetic reproductive process may increase the chance that sample and replicate DNA become contaminated leading to amplification of the wrong DNA.[67] Quality control is a serious problem in any forensic laboratory, but it is heightened in the context of hypersensitive PCR testing. There is danger of contamination from handling in the field or laboratory. There is the potential for contamination of evidence and reaction solutions from prior amplifications. There is also a threat of contamination from samples containing the blood of two or more individuals. As we have seen in many famous (and some might say infamous) cases, defense attorneys will often attack the way that evidence is handled as well as those who collect and analyze it.

B. Statistical Analysis

Once a match is determined under either the RFLP or PCR method, experts hypothesize the likelihood that the unknown sample came from someone other than the suspect in a process known as population frequency calculation. Using complex mathematical theories, scientists generate a ratio to express the statistical likelihood that an unrelated individual chosen at random from a particular population could have the same DNA profile as the suspect.[68] The FBI uses a method known as "fixed bin analysis"[69] which applies what is commonly known as the "product rule."[70]

The product rule first looks at the statistical frequency with which each allele in a DNA sample occurs in the general population.[71] The FBI has constructed genetic databases to hypothesize about the frequency of a specific allele in the general population.[72] For example, they can look at how often the allele for blue eyes occurs in the sample database and make assumptions about what percentage of people in

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64. *See The DNA Litigation Project* (visited Dec. 4, 1998) <http://www.dnai.com/~dna-law/infopage/info.htm>.

65. *See* Smith & Gordon, *supra* note 2, at 2471 (citing HARLAN LEVY, AND THE BLOOD CRIED OUT: A PROSECUTOR'S SPELLBINDING ACCOUNT OF THE POWER OF DNA 52, 138 (1996)).

66. *See id.* at 2470.

67. *See id.* at 2471; *see generally* Margaret A. Berger, *Laboratory Error Seen Through the Lens of Science and Policy*, 30 U.C. DAVIS L. REV. 1081 (1997).

68. *See* State v. Vandebogart, 616 A.2d 483, 486 (N.H. 1992).

69. *See id.* at 488 ("'Fixed bin analysis' is the FBI's method for assigning each band in a DNA profile a value or frequency that represents how often a particular allele may occur at a specific VNTR location in a given population.").

70. *See* Smith & Gordon, *supra* note 2, at 2474.

71. *See id.*

72. *See id.*

the general population have the same blue eyes. The scientists actually look at the location of an allele at a specific locus, but the analogy is the same.[73] After individual frequencies are determined, they are multiplied to hypothesize how often patterns of alleles occur together.[74] For example, one takes the frequency with which people have blue eyes and the frequency with which people have brown hair and multiply those together to determine the frequency with which people have both blue eyes and brown hair. This calculation is referred to as the genotype frequency. As mentioned previously, a human's genetic code has millions of alleles which can differ from one person to the next. When the frequencies of hundreds or thousands of these alleles are multiplied together to determine the frequency of a specific pattern, scientists are able to hypothesize how many individuals in a given population are likely to have the same pattern as this individual. This statistical isolation is the essence of DNA identification.

Analysis under the product rule is often criticized by scientists and mathematicians who contend that its underlying principles are flawed. The two primary assumptions made under the product rule are that the individual allele frequencies are correct and that the allele frequencies occur independent of other alleles.[75] Critics frequently question the first assumption, arguing that the FBI database is based upon too limited a sample. Even the smallest miscalculation of individual frequencies would drastically change the population analysis under the product rule.

Scientists most often question the assumption that all allele frequencies occur independent of each other. If, for example, three in one hundred people had a gene for purple hair and three in one hundred had a gene for red eyes, the product rule would tell us that nine in ten thousand people have the gene for both. That assumes the gene for purple hair is not dependent upon the gene for red eyes. Critics argue that it is possible that there may be a genetic tie between certain alleles and that a person with purple hair would necessarily have red eyes. In that case, the three in the sample with red eyes were the three in the sample with purple hair. Under that analysis we see that 3% of people within this sample would have the alleles for both purple hair and red eyes. Under the product rule, only 0.0009% of people would have the alleles for both purple hair and red eyes. This is an oversimplification of the analysis, but it conveys the point that there may be a significant problem with the product rule if certain alleles are dependent upon each other. This may be especially true for minorities.

Many scientists argue that there are genetic substructures within minority groups that are not independent. In *The Admission of DNA Evidence in State and Federal Courts*, George Bundy Smith and Janet A. Gordon contend that

> [t]he most powerful criticism of DNA forensic evidence concerns population substructures; that is "the presence of subgroups with varying DNA patterns that tend to mate among themselves." The existence of population substructures

73. *See id.*
74. *See id.*
75. *See id.*

> negates the assumption of the independence of alleles at a specific locus, and calls into question the validity of genotype frequencies across loci.[76]

Opponents argue that these substructures make it more likely that members of a minority will fall victim to a false identification.[77] Critics contend that this false identification occurs because the dependent alleles are maintained within certain populations. When these alleles are identified in PCR evidence, the product rule mistakenly applies them to the general population. When analyzed within the general population, the inflated ratio from these alleles seems to identify a specific suspect.[78] Referring to my previous example, prosecutors are more likely to think they have the correct suspect if only 0.0009%, as opposed to 3%, of the population shares that genetic code.[79]

PCR evidence is also criticized under the product rule because that analysis necessarily relies on identifying those alleles for which the ATCG sequencing is known. The test only compares specific alleles whereas the RFLP test compares a wide range. For example, the DQA1 test, one of the most widely used PCR tests, targets six known allele combinations.[80] Because the comparison between the samples is based upon only these few alleles, the statistical analysis is significantly less identifying than that of the RFLP. Consequently, states like Nebraska have rejected PCR evidence holding that its admission may be more prejudicial than probative.

Defense attorneys argue that the admission of PCR evidence under such questionable and limited analysis is too prejudicial. In *Stills*, the New Mexico Supreme Court rejected this argument holding that issues surrounding the integrity of evidence or the validity of statistical analysis should be argued before the jury.

V. RATIONALE

In *Stills*, the New Mexico Supreme Court held that results from the PCR method of DNA analysis were admissible in New Mexico courts. The court primarily relied upon its holding in *Anderson*.[81] The fundamental issue before the court was whether or not PCR results were sufficiently reliable to allow their admission in criminal trials. In *Anderson*, the court used the four factors established in *Daubert* to determine whether or not the RFLP method of DNA analysis was sufficiently reliable to allow RFLP results to be admitted in New Mexico courts.[82] Stills

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76. *See* Smith & Gordon, *supra* note 2, at 2478 (quoting David H. Kaye, *DNA Evidence: Probability, Population Genetics, and the Courts*, 7 HARV. J.L. & TECH. 101, 107-08 (1993)).

77. *See* Gibeaut, *supra* note 36, at 40.

78. For example, in *State v. Begley*, 956 S.W.2d 471 (Tenn. 1997), a state expert determined that 18% of the black population could account for DNA found in blood spots on the pants of a man who had been convicted of kidnapping, rape, and attempted murder. In *Walker v. State*, 707 So.2d 300 (Fla. 1997), PCR testing of a cigarette butt showed the presence of DNA shared by 12.2 percent of the black population.

79. *See* discussion *supra* text accompanying notes 75-76.

80. *See The DNA Litigation Project* (visited Dec. 4, 1998) <http://www.dnai.com/~dna-law/infopage/info.htm>.

81. *See Stills*, 125 N.M. at 72, 957 P.2d at 57 ("In State v. Anderson, we held that DNA evidence is admissible in New Mexico and that questions concerning the test results or statistical probabilities go to the weight of the evidence and are the concern of the fact finder.").

82. *See* discussion *supra* Part III.

challenged the reliability of PCR analysis with respect to the first, third, and fourth factors.[83]

The first factor requires that the technique can be (and has been) tested.[84] Stills argued that, according to the National Research Council, the PCR method had not been sufficiently tested.[85] The court held that the defendant conceded the "testability" of PCR analysis by presenting "evidence about deficiencies in both the results and the testing of the results."[86] The court further held that the PCR method had been sufficiently tested by "countless number[s] of tests and experiments . . . since the method was first discovered in 1985."[87]

The third factor requires the court to consider the potential rate of error in using the PCR method and the standards controlling the PCR technique's operation. Stills was challenging the overall integrity of the analyzing laboratory's methods and the methods used in this specific test.[88] The court pointed to *Anderson*, reaffirming that "controversy over the results and statistical analysis goes to the weight of the evidence and is properly left to the trier of fact."[89] The court determined that the jury had heard sufficient testimony from various experts regarding the validity of both the technique and the laboratory to come to its own conclusion as to the potential rate of error. Stills argued that "*Anderson* improperly held that deficiencies in calculating the known rate of error . . . concerns the weight of the evidence, not the admissibility."[90] The court rejected this notion, affirmed its decision in *Anderson*, and held that PCR analysis would be held to the same standard.

The fourth factor looks at whether the PCR technique has been accepted by the scientific community. Stills argued that a National Research Council report (NRC I) claimed that the PCR method was flawed.[91] The Court noted that NRC I was written in 1992 and since that time the PCR technique has evolved. The National Research Council issued a second report in late 1994 (NRC II) which claimed that the PCR method and statistical analysis had been improved.[92] Based on expert testimony about the improvement and peer review of the PCR method, the court rejected the Stills argument and held that PCR had been accepted in the scientific community.[93]

After considering the four *Daubert* factors, the court determined that the PCR method and results were sufficiently reliable, and thus admissible, under the

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83. Stills conceded that the second factor, peer review and technology, was satisfied. *See Stills*, 125 N.M. at 73, 957 P.2d at 58.

84. *See Anderson*, 118 N.M. at 291, 881 P.2d at 36.

85. *See Stills*, 125 N.M. at 73, 957 P.2d at 58.

86. *See id.* (quoting United States v. Bonds, 12 F.3d 540, 559 (6th Cir. (1993)).

87. *See id.* (quoting Oklahoma City University of Law, A Symposium on Film and Law, Brian Huseman, *Taylor v. State, Rule 706, and the DNA Database: Future Directions in DNA Evidence*, 22 OKLA. CITY U.L.REV 397 (1997)).

88. Roche Biomedical Laboratories was the commercial laboratory which analyzed the evidence in *Stills*.

89. *See Anderson*, 118 N.M. at 303, 881 P.2d at 48.

90. *See Stills*, 125 N.M. at 73, 957 P.2d at 58.

91. *See id.* at 74, 957 P.2d at 59.

92. *See* COMMITTEE ON DNA FORENSIC SCIENCE: AN UPDATE, NATIONAL RESEARCH COUNCIL, THE EVALUATION OF FORENSIC DNA EVIDENCE (1996).

93. *See Stills*, 125 N.M. at 74, 957 P.2d at 59

Anderson test. It held that "[i]t is the role of the jury to weigh evidence concerning the manner in which the evidence was collected and stored, and evidence concerning the results of the [PCR] test and statistical calculations and resolve any controversy with respect to this evidence."[94] In essence, the holding allows any PCR evidence to be admitted and requires the jury, not the judge, to decide its reliability.

VI. ANALYSIS: WHAT ABOUT THE ROLE OF THE JUDGE AS EVIDENTIARY GATEKEEPER?

One of the crucial roles that a judge assumes in any trial is that of evidentiary gatekeeper. It is the judge's responsibility to regulate the flow of information that comes before the jury. "In a jury trial, the judge functions as a gatekeeper, filtering the evidence actually presented to the factfinder to ensure that the factfinder's conclusions are not based on improper considerations or evidence."[95] In *Daubert* and *General Electric v. Joiner*,[96] the Supreme Court has held and reaffirmed that judges are required to act as evidentiary gatekeepers particularly where novel scientific evidence is concerned. Ultimately, the Court has made judges responsible for the validity of evidence in their courtrooms.[97] Because the admission of scientific evidence necessarily carries with it a degree of implied integrity not found in other types of evidence, judges are to analyze the technique and its application carefully before presenting that evidence to a jury.[98]

The New Mexico Supreme Court, while adopting the principles of *Daubert*, has failed to follow the Court's gatekeeping mandate. The holdings in *State v. Stills* and *State v. Anderson* can and will be read to allow any PCR analysis under any circumstance to be presented to the factfinder. If one of the judge's roles is to prevent questionable evidence from being presented to a jury, what is a judge to do when questionable PCR evidence is presented? The Supreme Court of New Mexico has left trial judges with little latitude to restrict such evidence. The alternative would be to give trial judges complete discretion. However, where the judge is unfamiliar with newly developed technologies, such as DNA analysis, that discretion may lead to prohibitions on valid evidence that would be otherwise admissible. One way for judges to reconcile their responsibility as gatekeeper and their inability to understand the principles of all novel scientific evidence is to appoint technical advisors.

A. *Technical Advisors*

In the article, *Improving Judicial Gatekeeping: Technical Advisors and Scientific Evidence*, the author suggests that technical advisors may be one way for the courts to more constructively limit the flow of DNA evidence to that which is sufficiently reliable.[99] In *Daubert*, the Court suggested that judges appoint their own experts,

94. *See id.* at 78, 957 P.2d at 63
95. State v. Campos, 122 N.M. 148, 157, 921 P.2d 1266 (1996).
96. 118 S. Ct. 512 (1997).
97. *See* Beecher-Monas, *supra* note 19, at 71.
98. *See id.*
99. *See* Note, *supra* note 18 at 942 ("[C]ourts can strike the appropriate balance between the need for independent judicial screening of scientific evidence and the need for expert scientific input by appointing their

under Fed. R. Evid. 706, to help them screen scientific evidence.[100] However this suggestion that judges rely on the aid of scientists seems to conflict with the *Daubert* principle that judges themselves determine reliability.[101] Another problem with a court-appointed technical advisor is that Rule 706 allows for the appointment of experts as witnesses.[102] Here, the court-appointed expert would make recommendations to the judge, as opposed to the jury, to augment evidentiary decisions.

Proponents argue that a technical advisor under Rule 706 would be permissible because the *Daubert* Court discussed using Rule 706 in precisely such a manner.[103] However, courts must create safeguards to prevent technical advisors from usurping the court's role as gatekeeper.[104]

> Whenever a complex question of science or technology emerges in litigation—one likely to have a far-reaching impact beyond the immediate interest of the parties—conscientious judges will be prone to seek more information, sua sponte, to add to their understanding. It is therefore imperative for modern society to include, within its governing rules structure, an ethically appropriate vehicle for judges to acquire, consider, and rely on that information.[105]

George Marlow argues that "[s]ome members of the judiciary have suggested that judges be allowed to . . . employ their own staff of scientific and technical experts to assist the court, ex parte, with complex issues of science and technology."[106] Other states seem to have taken a similar stance. In Florida, the state supreme court held that questions about the validity and integrity of DNA evidence should be addressed before that evidence is presented to a jury by bringing in outside advisors to educate the court.[107]

VII. IMPLICATIONS: NOW THAT WE HAVE PCR, WHAT DO WE DO WITH IT?

DNA evidence has been used widely in the courtroom since the late 1980s and has now become almost commonplace. It was used in the infamous 1995 O.J. Simpson criminal trial and the Jon Benet Ramsey murder investigation. It was used to clear deceased Sam Sheppard, the famous physician who was accused of killing

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own technical advisors and adopting procedural protections that make such appointments subject to scrutiny by the parties.").

100. *See Daubert*, 509 U.S. at 595.

101. *See* Note, *supra* note 48, at 947.

102. *See id.* at 951.

103. *See id.* at 951 n.81 (citing *Daubert*, 509 U.S. at 595 ("Throughout, a judge assessing a proffer of expert scientific testimony . . . should also be mindful of other applicable rules . . . Rule 706 allows the court at its discretion to procure the assistance of an expert of its own choosing.")).

104. *See id.* at 952 (suggesting safeguards in three areas: 1) Notice and Selection of the Expert; 2) Defining the Scope of the Expert's Duties; and 3) Written Reports and Interaction with the Technical Advisor).

105. George D. Marlow, *From Black Robes to White Lab Coats: The Ethical Implications of Judge's Sua Sponte, Ex Parte Acquisition of Social and Other Scientific Evidence During the Decision Making Process*, 72 ST. JOHN'S L. REV. 291, 334 (1998).

106. *See id.* at 329 (citing Harold Leventhal, *Environmental Decisionmaking and the Role of the Courts*, 122 U. PA. L. REV. 509, 547-553 (1974)).

107. *See* Murray v. State, 692 So.2d 157 (Fla. 1997).

his wife in 1954, and who inspired the TV series and movie "The Fugitive."[108] DNA evidence is an increasingly popular and powerful tool for both the prosecution and defense, as well as those individuals appealing prior convictions.

In 1994, President Clinton signed the DNA Identification Act which establishes grants to various states to develop new forensic research laboratories specializing in DNA analysis.[109] The Act created the DNA Standards and Advisory Board in order to establish certain guidelines that forensics laboratories must follow, thus guaranteeing improved standards for the collection and analysis of DNA evidence.[110] The Act initiated a national DNA index to which all states have access.[111] The index will allow law enforcement officers and prosecutors to identify possible suspects much faster as the DNA database accumulates genetic records. In 1996, New Mexico passed legislation to begin developing laboratories to participate in this nationwide database.[112] Therefore, DNA evidence will increasingly become the foundation of many New Mexico criminal cases.

However, DNA evidence is not always the crucial element of a case that prosecutors believe it to be. In Walter Gordon's article, *Reflections of a Criminal Defense Lawyer on the Simpson Trial*, he laments the failing of the DNA evidence:

> [T]he killer left blood at the scene. The killer was cut on his left side and deposited blood drops to the left of the bloody footprint. Simpson was cut on his left finger the night before he left Los Angeles. [PCR and RFLP] DNA testing was done on the blood evidence from the Bundy crime scene. . . None of the tests excluded Simpson. RFLP testing on one of the killer's Bundy blood drops identified Simpson, and a rear gate stain also tested RFLP positive for Simpson. In both cases the odds against the blood not belonging to Simpson were astronomical. PCR testing was done on four other blood drops on the Bundy trail, and all identified Simpson as the donor. . . RFLP testing on the Bronco console found blood stains from Simpson and Goldman, while a PCR test identified blood from Nicole Brown Simpson. PCR testing on the steering wheel found a mixture of blood from Simpson and Nicole Brown Simpson . . . RFLP and PCR testing also identified bloodstains from Nicole Brown Simpson on the ankle of the socks.[113]

Even though the DNA evidence seemed concrete, attacks upon the handling and analysis of the evidence proved effective. Collateral attacks upon the methods of DNA analysis are likely to be an attorney's strongest argument against incriminating DNA evidence.[114]

Under *Stills*, defense attorneys will have the opportunity to explain to the jury that all DNA evidence is admissible in New Mexico courts, regardless of its actual validity. Therefore, collateral attacks upon its validity are not only strategically

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108. A DNA test proved that blood found at the murder scene was neither Sheppard's nor his wife's, meaning someone else was there.

109. *See* DNA Identification Act of 1994, 42 U.S.C.A. §§ 14131-34.

110. *See id.*

111. *See id.*

112. *See* New Mexico DNA Identification Act, N.M. STAT. ANN. §§ 29-16-1 to -13 (Repl. Pamp. 1997).

113. Walter L. Gordon III, *Reflections of a Criminal Defense Lawyer on the Simpson Trial*, 9/22/97 J. SOC. ISSUES 417 (1997).

114. *See* Beecher-Monas, *supra* note 19, at 67.

advisable, they are necessary for any responsible defense. The methods of collection, handling, and analysis will be as suspect as the evidence itself. The problem for most defense attorneys will be the costs of presenting such a technical defense. Those scientists qualified to assist the litigants and testify in cases involving DNA evidence frequently bill their time at $150-$250 per hour.[115] Most defendants will be unable to afford the army of expert witnesses necessary to successfully attack DNA evidence, particularly if they are subject to the limited resources of a public defender.

The prosecution generally has the advantage because they have more resources and funds at their disposal. Moreover, the individuals who collect and handle the DNA evidence are generally law enforcement officers testifying on behalf of the prosecution. Usually analyzed by a private laboratory hired by the prosecution, the test results are presented and explained by several prosecution witnesses. Scientists hired by the prosecution to emphasize the high probability of the defendant's guilt generally present the population analysis. As a result of these advantages, prosecutors will have the upper hand in presenting DNA evidence to the jury. *Stills* provides prosecutors with, perhaps, even more ammunition by allowing any PCR evidence under any circumstance.

CONCLUSION

Regardless of whether PCR evidence is truly reliable or whether statistical analysis based upon it is indeed valid, DNA evidence is quickly becoming the evidentiary cornerstone of criminal cases for both the prosecution and defense. *State v. Stills,* in conjunction with *State v. Anderson,* continues an open evidentiary policy in New Mexico by allowing all PCR and RFLP evidence to be submitted to the factfinder. Although PCR evidence has been criticized as less reliable, the Supreme Court of New Mexico has determined that issues as to its reliability should be argued before the factfinder. This carte blanche acceptance ultimately serves to restrict the gatekeeping power of New Mexico courts.

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115. *See The DNA Litigation Project* (visited Dec. 4, 1998) <http://www.dnai.com/~dna-law/infopage/info.htm>.