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THE DNA PATERNITY TEST: LEGISLATING THE FUTURE
PATERNITY ACTION

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I. INTRODUCTION

As society enters a new millennium, the age-old problem of determining paternity is finally being eradicated. Science has provided the solution to this problem through the precision of DNA profiling.⁴ Accordingly, courts are beginning to accept and apply DNA profiling by holding this evidence admissible.⁵ Courts may now order the child, the biological mother and the putative father, as well as other relevant parties such as the child's siblings or grandparents, to submit to both traditional and DNA paternity tests.⁶ By extracting a small quantity of blood or tissue from the child, the mother and the putative father under highly controlled testing conditions and then subjecting the sample to DNA profiling, it is now possible to scientifically determine the probability of paternity almost to a near certainty which should more than fulfill both substantive and procedural legal requirements.⁷

The significance of this new paternity test is two-fold. First, all future contested paternity actions would be categorically transformed if the test results, when above a certain percentage indicating paternity, are accorded conclusive evidential weight of paternity. This would create a presumption of

⁴DNA profiling is also known as DNA fingerprinting (patented term used by Cellmark Diagnostics, a biochemical laboratory), DNA typing (see William C. Thompson & Simon Ford, *DNA Typing: Acceptance and Weight of the New Genetic Identification Tests*, 75 VA. L. REV. 45 (1989)) and DNA print identification (patented term by Lifecodes Corporation, a biochemical laboratory). See Jessie Jo Barr, Note, *The Use of DNA Typing in Criminal Prosecutions: A Flawless Partnership of Law and Science*, 34 N.Y.L. SCH. L. REV. 485 n.5 (1989). This Article will use the term "DNA profiling" because it is the term used by the Federal Bureau of Investigation. *Id.* at 487 n.8.

⁵See, e.g., *Andrews v. State*, 533 So. 2d 841 (Fla. Dist. Ct. App. 1988), *Spencer v. Commonwealth*, 385 S.E.2d 850 & 384 S.E.2d 785 (Va. 1989), *Cobey v. Maryland*, 559 A.2d 391 (Md. App. Ct. 1989), *In re Adoption of Baby Girl S*, 532 N.Y.S.2d 634 (Surr. Ct. 1988). Cf. *People v. Castro*, 545 N.Y.S.2d 985 (Sup. Ct. 1989) (DNA profiling theory accepted but procedure used to achieve results rejected). See *infra* note 195.

⁶It is well settled law that a court may constitutionally order blood tests. See *State v. Damm*, 266 N.W. 667 (S.D. 1936) (trial court has inherent power to order parties to submit to blood tests in order to ascertain the truth). See also *In re Rogers*, 583 A.2d 782, 784 (N.J. Super. Ct. App. Div. 1990); *Phillips v. Jackson*, 615 P.2d 1228 (Utah 1980); *Wilson v. State*, 225 So. 2d 321 (Fla. 1969); *Anthony v. Anthony*, 74 A.2d 919 (N.J. Super. Ct. Ch. Div. 1950). By extension, there is no reason to doubt the constitutionality of a court-ordered blood or tissue test for DNA profiling, as long as it is not invasive. See WILLIAM J. CURRAN & E. DONALD SHAPIRO, *LAW, MEDICINE, AND FORENSIC SCIENCE* 154-55 (3d ed. 1982).

⁷The probability of paternity is a mathematical concept based on the frequency of specific gene variations—called alleles—occurring in the general population which determines the likelihood whether the accused man is the biological father. See generally DANIEL L. HARTL, *A PRIMER ON POPULATION GENETICS* (1981). See also *infra* text at 24-29.

substantive law shifting the burden of production and persuasion from the one bringing the action to the other party.⁸ Whereas traditional paternity testing only conclusively excluded a putative father,⁹ this new test can statistically exclude the rest of the world's male population by a probability formula.¹⁰ Thus, the putative father can now be conclusively included into the set of possible fathers which is infinitesimally small.¹¹ Accordingly, the likelihood

⁸This is a classic Morgan presumption that shifts both the burden of production and the burden of persuasion to the other party. It is also possible that a Thayer-Wigmore "bursting bubble" presumption be applied whereby the presumption of paternity created by a positive DNA paternity test could simply be rebutted by the other party meeting their burden of production and without the burden of persuasion ever shifting. See CHARLES TILFORD MCCORMICK, MCCORMICK'S HANDBOOK OF THE LAW OF EVIDENCE 947-80 (3d ed. 1984).

⁹Traditionally, forensic blood group testing was used to exclude suspects, as when fingerprints do not match. However, unlike fingerprints, the test could not be used to establish a match because blood groupings are simply too large. See *infra* text at 25-27. See also *Little v. Streater*, 452 U.S. 1, 7 (1981) ("Since millions of men belong to the possible groups and types, a blood grouping test cannot conclusively establish paternity. However it can demonstrate nonpaternity . . .").

¹⁰Under the Hardy-Weinberg principal, population gene frequencies and population genotype frequencies remain constant from generation to generation if mating is random and if mutation, selection, immigration and emigration do not occur. The study of population genetics uses mathematical models utilizing the Hardy-Weinberg principal in order to study the relationship between the allele and genotype frequencies. GEORGE J. BREWER & CHARLES F. SING, GENETICS 588-642 (1983). The Hardy-Weinberg principle is expressed algebraically as $P^2 + 2PQ + Q^2$, where P and Q are the percentages of the population having two different alleles. For example, where P and Q are Rh positive and Rh negative respectively and where Rh positive blood occurs in 60% of the population and Rh negative blood occurs in 40% of the population, the equation tells us that $P^2 = .36$, $2PQ = .48$, and $Q^2 = .16$. Since $.36 + .48 + .16 = 1$, the population is in Hardy-Weinberg "equilibrium" for these alleles. *People v. Castro*, 545 N.Y.S.2d 985, 993 (Sup. Ct. 1989); Thompson & Ford, *supra* note 4, at 85. There are some who question the precision of DNA profiling based upon the Hardy-Weinberg principal:

[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 . . .

Eric S. Lander, *Population Genetic Considerations in the Forensic Use of DNA Typing*, 32 BANBURY REPORT: DNA TECHNOLOGY AND FORENSIC SCIENCE 143, 153 (1989). See *infra* notes 145-156 and accompanying text.

¹¹While the methodology is to *exclude* the putative father as the biological father, if exclusion does not occur then the putative father must still be suspect. There comes the point where if the results of all the exclusion tests are negative, a probability of paternity (inclusion) is determined. See *infra* notes 145-56 and accompanying text.

that a properly conducted positive paternity test is wrong is astronomically remote.¹²

The second significant factor of the new paternity test is that state legislatures must now respond quickly to this new technology.¹³ Currently, although many states have attempted to "modernize" their paternity statutes in one way or another,¹⁴ legal battles are being and have been fought over basic statutory

¹²Theoretically, if every single gene of the child, the mother and the putative father could be tested, and no test result excluded the putative father, then a perfect 100% inclusion would be achieved. While it is impossible—or at least impracticable—to test every gene, it is currently possible to narrow the chances that a putative father is not the biological father almost to an absolute of zero. See *Andrews v. State*, 533 So. 2d 841, 845 (Fla. Dist. Ct. App. 1988) (scientific testimony that DNA tests showed the chances that the defendant was not the donor of the DNA was 1 in 839,914,540 or .0000012%).

¹³Even the federal government, under the Aid to Families With Dependent Children ("AFDC") Act, has promoted genetic testing to determine paternity and has conditioned states' receipt of federal monies on such legislation. 42 U.S.C.A. 666(a)(5)(A) (West 1991). DNA profiling is becoming an accepted method to determine paternity in many jurisdictions. *Barbara A. v. Gerald J.*, 553 N.Y.S.2d 638 (Fam. Ct. 1990); District of Columbia *ex rel. J.A.B. v. W.R.*, 17 Fam. L. Rep. (BNA) 1499 (D.C. Super. Ct. Fam. Div. 1991). See generally SIDNEY B. SCHATKIN, *DISPUTED PATERNITY PROCEEDINGS* § 11B.07 (4th ed. 1988 & Supp. 1992). However, some commentators are concerned about the application of DNA profiling to criminal investigations. See Gina Kolata, *Justice System Takes a Hard Look at Scientific Evidence*, N.Y. TIMES, Feb. 24, 1991, at E6. See *infra* notes 198-204 and accompanying text for a discussion of the differences between civil and criminal forensic uses of DNA profiling.

¹⁴The diversity and differences between the paternity statutes in all fifty states is too voluminous to present. These specific differences, however, are not the subject of our concern. What does concern us is that these differences do exist and that there is no uniformity. Moreover, since all jurisdictions have and are moving towards uniformity in many areas of law, there is no reason that a uniform code could not be applied. However, past attempts at a uniform code have failed dismally. The most successful is the Uniform Parentage Act ("UPA") which allows the admission into evidence of an expert's opinion concerning the statistical probability of the putative father's paternity based upon the result of a blood test. Unif. Parentage Act § 12(3), 9B U.L.A. 317 (1987 and Supp. 1992). Only eighteen states have adopted the UPA: Alabama, California, Colorado, Delaware, Hawaii, Illinois, Kansas, Minnesota, Missouri, Montana, Nevada, New Jersey, New Mexico, North Dakota, Ohio, Rhode Island, Washington and Wyoming. *Id.* at 287. Next in popularity is the Uniform Act on Paternity ("UAP") which allows determinations based only upon the agreement by all the experts. Unif. Act on Paternity § 10, 9B U.L.A. 362 (1987 and Supp. 1992). Only six states have adopted the UAP: Kentucky, Maine, Mississippi, New Hampshire, Rhode Island and Utah. *Id.* at 347. [Note that Rhode Island has adopted parts of both]. There is also the Uniform Act on Blood Tests to Determine Paternity ("UABTDP") which has been superseded—for the most part—by the UPA. HOMER H. CLARK, JR., *THE LAW OF DOMESTIC RELATIONS IN THE UNITED STATES* § 144 (2d ed. 1987). Currently, only Oklahoma, Oregon and Pennsylvania, and to some extent, California, use the UABTDP. All other jurisdictions have either a mixture of all three model acts or completely independent, and different, legislation. See, e.g., ALASKA STAT. § 25.20.050 (1991) ARIZ. REV. STAT. ANN. § 12-847 (1991); CONN. GEN. STAT. § 46b-168 (1990); GA. CODE ANN. § 19-10-1 (Michie 1991); IDAHO CODE § 7-1116 (1992); IND. CODE ANN. § 31-6-6.1-8 (Burns 1991); IOWA CODE § 675.4 (1991); LA. REV. STAT. ANN. §§ 9:396-9:398 (West 1991); MD. FAM. LAW CODE ANN.

construction simply because the laws have not kept current with the new technology.¹⁵ Moreover, some of those states which have "modernized" their paternity statutes have not legislated a comprehensive paternity determination law. Therefore, all state legislatures should immediately create statutes reflecting the near precision of this technology by adopting model legislation, such as the Uniform Paternity Determination Act ("UPDA") suggested in this Article. Already at least twenty-one states have passed legislation which creates a presumption of paternity if the current test results are above a certain probability of paternity percentage; these laws shift the burden of proof to the putative father who must prove by either a preponderance of the evidence or by clear and convincing evidence that he is not the father.¹⁶ However, the issues

§ 5-1029 (1991); MASS. GEN. L. ch. 209C (1992); NEB. REV. STAT. § 43-1414 (1990); N.Y. FAM. CT. ACT. § 532 (McKinney 1990); N.C. GEN. STAT. § 49-14 (1991); S.C. CODE ANN. § 20-7-954 (Law Co-op. 1990); S.D. CODIFIED LAWS ANN. § 25-8-7 (1992); TENN. CODE ANN. § 24-7-112 (1991); VT. STAT. ANN. tit. 15, § 415 (1991).

¹⁵See, e.g., *Le Fevre v. Sullivan*, 785 F. Supp. 1402 (C.D. Cal. 1991) (DNA profiling test of deceased putative father did not show clear and convincing evidence of paternity required by California intestacy law as well as the fact that there is no provision under any California law for DNA profiling to provide presumptive proof of parentage); *Commonwealth v. Beausoleil*, 490 N.E.2d 788, 792 (Mass. 1986) (statute, specifically referring to "blood grouping tests", did not include HLA test because it is a tissue typing procedure); *Simons v. Jorg*, 375 So. 2d 288 (Fla. Dist. Ct. App. 1979) (HLA test does not appear on its face to be a blood grouping test). Cf. *Cutchember v. Payne*, 466 A.2d 1240, 1242 (D.C. Ct. App. 1983) (HLA test is not a blood test but admissible because Congress could not have intended to prohibit a test that did not exist at the time of legislation).

¹⁶ARK. CODE STAT. ANN. § 9-27-342(h)(2)(B) (Michie 1992) (paternity presumed if probability of paternity is above 95% and allegation is corroborated by biological mother's testimony); CAL. EVID. CODE § 895.5(a) (Deering 1992) (paternity presumed if paternity index is 100 to 1 or higher but rebuttable by preponderance of the evidence); COLO. REV. STAT. § 19-4-105(f) (1991) (paternity presumed if probability is 97% or higher but rebuttable by clear and convincing evidence); FLA. STAT. ch. 742.12(1) (1991) (paternity presumed if probability is 95% or higher but rebuttable (no statutory standard)); GA. CODE ANN. § 53-4-4 (1992) (paternity presumed if probability is 97% or higher but rebuttable by clear and convincing evidence); ILL. REV. STAT. ch. 40, para. 2511(f)(4) (1991) (paternity presumed if combined paternity index is at least 500 to 1 but rebuttable by clear and convincing evidence); IOWA SF2316 (1992) (paternity presumed if 95% or higher but rebuttable by clear and convincing evidence); KY. REV. STAT. ANN. § 406.111 (Baldwin, 1992) (paternity presumed if probability is 99% or higher or paternity index is 100 to 1 or greater but rebuttable by preponderance of evidence); MICH. COMP. LAWS § 722.716(5) (1991) (paternity presumed if probability is 99% or higher but rebuttable (no statutory standard)); MINN. STAT. § 257.55(1)(a) (1991) (paternity presumed if probability is 99% but rebuttable by clear and convincing evidence); MONT. CODE ANN. § 40-5-234(3)(b) (1992) (paternity presumed if 95% or higher but rebuttable by preponderance of the evidence); N.H. REV. STAT. ANN. §§ 522:4(l)(c) & 522:4(l)(d) (1991) (paternity presumed if probability is 97% but rebuttable by clear and convincing evidence); N.M. STAT. ANN. § 40-11-5(D) (Michie 1992) (paternity presumed if probability is 99% or higher but rebuttable by clear and convincing evidence); OHIO REV. CODE ANN. § 3111.03(A)(5) (Anderson 1992) (paternity presumed if probability is 95% or higher but rebuttable by clear and convincing evidence); OKLA. STAT. ANN. tit. 10, § 504(C) (West 1991) (paternity presumed if probability is 95% but rebuttable by clear and convincing evidence); TEX. FAM. CODE

of jurisdiction standing, conflict of laws, presumptions, testing procedures and other issues need to be addressed so that all states' paternity laws are uniform and comprehensive.

Moreover, because DNA profiling has been incorporated into the traditional paternity test by several major testing laboratories, the cost of these tests are no longer exorbitant. Thus, with the economic impediment eliminated states may now legislate that the test creates a substantive presumption of paternity. Because the percentage of certainty so approaches 100 percent, statutes creating such a presumption should be found constitutional.¹⁷ Therefore, the judicial systems of those states adopting the UPDA will most likely never have to spend the public's money—along with eliminating the parties' agony—on a paternity trial in the future, except in rare instances,¹⁸ because there will almost never be any substantive issues of fact to try.

This Article will first briefly examine the historical development of the paternity suit in the beginning of Part II. Part II will then focus upon the standards of proof, presumptions and affirmative defenses concomitant to the

ANN. § 13.06(c) (West 1992) (paternity presumed if probability of exclusion is 95% which shifts burden of proof); UTAH CODE ANN. § 78-45a-10 (Mitchie 1992) (paternity presumed if paternity index is 100 or higher but rebuttable by clear and convincing evidence); VA. CODE ANN. § 20-49.1(B) (Michie 1991) (paternity presumed if probability is 98% or higher and no rebuttal); W. VA. CODE § 48A-6-3(a)(3) (1992) (probability of paternity of 98% is clear and convincing evidence of paternity); WIS. STAT. § 767.48(b)(1) (1989-1990) (paternity presumed if probability is 99% or higher but rebuttable (no statutory standard)); WYO. STAT. § 14-2-109(e)(iv) (1991) (paternity presumed if probability is 97% but rebuttable by clear and convincing evidence).

¹⁷This presumption would not only shift the burden of proof to the other party, but also could raise the standard of proof from a preponderance of the evidence or clear and convincing evidence to proof beyond a reasonable doubt. Moreover, it is possible that some jurisdictions might want to create an irrebuttable—or conclusive—presumption. The constitutionality of the conclusive presumption was affirmed by the Supreme Court in 1989. See *Michael H. v. Gerald D.*, 491 U.S. 110 (1989) (upholding California's conclusive presumption of legitimacy even though the putative father's probability of paternity was 98.07%). See Mary Kay Kisthardt, *Of Fatherhood, Families and Fantasy: The Legacy of Michael H. v. Gerald D.*, 65 TUL. L. REV. 585 (1991); Joan C. Sylvain, Note, *Michael H. v. Gerald D.: The Presumption of Paternity*, 39 CATH. U.L. REV. 831 (1990). Curiously, if California legislated a positive DNA paternity test as a conclusive presumption, then *Michael H.* might have been decided differently if the conclusive presumption of paternity overrode the conclusive presumption of legitimacy. See *Atkinson v. Hall*, 556 A.2d 651 (Me. 1989). If the presumptions are both rebuttable, the rebuttal standards would decide which presumption would prevail. For example, if in *Michael H.* the presumption of legitimacy were rebuttable only by proof beyond a reasonable doubt, and if a positive DNA paternity test were rebuttable by clear and convincing evidence, the result would still have been the same because the presumption of legitimacy would "trump" the presumption of paternity. See also *infra* notes 68-84 and accompanying text.

¹⁸Assuming there could be a rare situation where DNA profiling would not be determinative of paternity, the traditional affirmative defenses should be left in place and available to a defendant. However, the burdens of production and persuasion would be great. See *infra* text at 44-46.

traditional paternity action. Part III will examine the concepts and legal applications behind blood group/genetic marker testing and the probability formulas derived from these tests used to exclude or include a putative father. Part IV will examine the technology behind DNA paternity testing and its current evidentiary admissibility. Part V will discuss some of the substantive and public policy issues relating to paternity determinations. Finally, in Part VI, we offer our version of a possible model uniform paternity statute which would create either a rebuttable or a conclusive presumption when the paternity test results achieve a certain level indicating paternity.

II. HISTORICAL OVERVIEW OF THE PATERNITY SUIT

It should be understood that almost all filiation proceedings are brought not just to adjudicate paternity but to achieve some other legal right associated with paternity. Usually it is the child's mother who brings the action to establish the putative father's support obligation.¹⁹ Today, most paternity actions are brought by government agencies, either directly or indirectly, on behalf of the mother who is seeking contribution from the putative father to support the child on public assistance.²⁰ In some instances, however, it is the father who

¹⁹Some states' statutes are ambiguous as to whether the woman who brings the action must be unmarried or whether only a married woman has standing to sue. See *State v. Hunt*, 368 P.2d 261 (Utah 1962); *State v. Tucker*, 486 P.2d 1072 (Wash. 1971).

²⁰See Jason Deparle, *Big Rise in Births Outside Wedlock*, N.Y. TIMES, July 14, 1993, at A1, A14. There is a "spectacular rise in out-of-wedlock births." Erik Eckholm, *Solutions on Welfare: They All Cost Money*, N.Y. TIMES, July 26, 1992, at A1, A18. In 1980, in which over 600,000 out of wedlock births occurred, there were some 150,000 paternity determinations. Harry D. Krause, *Concerns of the Legal Professions*, in INCLUSIONS PROBABILITIES IN PARENTAGE TESTING 13 (R. Walker ed. 1983). In 1991, Health and Human Services Secretary Dr. Louis W. Sullivan reported that a record number of paternities—400,000—were established in 1990, a year in which well over a million out of wedlock births occurred. Child Support Report, Office of Child Support Enforcement, Administration for Children and Families, U.S. Dep't of Health and Human Services, May 1991, at 1.

The following table illustrates the recent increases in out-of-wedlock births occurring in the United States:

BIRTHS TO UNMARRIED WOMEN IN THE UNITED STATES		
Year	Number of Births	Percent Increase
1989	1,094,200	9%
1988	1,005,300	8%
1987	933,000	6%
1986	878,500	6%
1985	828,200	24%
1980	665,700	67%
1970	398,700	- - -

brings the action in order to establish his visitation rights.²¹ Paternity suits are also used to provide evidence of adultery in a divorce.²² In some states the child, whether of minority or majority age, may initiate the action in order to establish inheritance rights, citizenship rights or support rights.²³ Dependent rights under worker compensation laws have turned on paternity determinations.²⁴ The action has been used as a defense to a defamation suit²⁵ and to convict rapists.²⁶ The federal government has even used it to enforce immigration laws by challenging the claims of foreigners who declared citizenship by descent.²⁷

A. *Origins Of The Paternity Action*

Historically, the origin of the paternity action is best examined by its relationship to illegitimacy. For as long as society has had the institution of marriage, it has also had the problem of illegitimacy. By definition, an illegitimate child is a child born out-of-wedlock or of adultery.²⁸ The traditional word for an out of wedlock child was a "bastard,"²⁹ and the paternity action of

U.S. Bureau of the Census, *Statistical Abstract of the United States*: 1992 69 (112th ed. 1992).

²¹See, e.g., *Michael H. v. Gerald D.*, 491 U.S. 110 (1989) (paternity action by putative father valid but barred by statutory presumption of legitimacy). *But see* *Roe v. Roe*, 316 N.Y.S.2d 94 (Fam. Ct. 1970) (no standing for putative father to bring paternity action).

²²See, e.g., *Dellaria v. Dellaria*, 52 N.Y.S.2d 607 (Sup. Ct. 1944); *Anthony v. Anthony*, 74 A.2d 919 (N.J. Super. Ct. Ch. Div. 1950).

²³Both the UPA and the UAP specifically permit the child to bring the action. Unif. Parentage Act § 6, 9B U.L.A. 302 (1987 & Supp. 1991); Unif. Act on Paternity § 2, 9B U.L.A. 352 (1987 & Supp. 1991). See also CLARK, *supra* note 14, § 4.4.

²⁴*R.L.J. v. Western Sprinklers, Inc.*, 844 P.2d 37 (Kan. App. 1992); *Killingsworth v. City of Wichita*, 830 P.2d 70 (Kan. App. 1992).

²⁵See *King v. Tanner*, 539 N.Y.S.2d 617 (Sup. Ct. 1989) (plaintiff's slander suit based on defendant's defamation that he was the father of her child dismissed on the defense of truth of paternity established by DNA profiling calculating his probability of paternity to be 99.993%).

²⁶See, e.g., *State v. Talton*, 497 A.2d 35 (Conn. 1985); *People v. Alzoubi*, 479 N.E.2d 1208 (Ill. App. Ct. 1985); *State v. Jackson*, 358 S.E.2d 679 (N.C. 1987); *People v. Wesley*, 533 N.Y.S.2d 643 (Albany County Ct. 1988), *companion case aff'd*, *People v. Bailey*, 549 N.Y.S.2d 846 (App. Div. 1989), *aff'd*, *People v. Wesley*, 589 N.Y.S.2d 197 (App. Div. 1992); *State v. Hill*, 570 N.E.2d 1138 (Ohio Ct. App. 1989); *State v. Hartman*, 426 N.W.2d 320 (Wis. 1988).

²⁷*Lue Chow Kon v. Brownell*, 122 F. Supp. 370 (S.D.N.Y. 1954), *aff'd*, 220 F.2d 187 (2d Cir. 1955).

²⁸See 10 C.J.S. *Bastards* § 1 (1938) and 14 C.J.S. *Children Out-of-Wedlock* § 2 (1991) for a survey of the various statutory or judicial definitions.

²⁹"Bastard, from the French *bas*, low or base, and *stard*, start, *editus*, *ortus*, sprung, signifies literally base born." GEORGE CRABB, A HISTORY OF ENGLISH LAW: OR AN ATTEMPT TO TRACE THE RISE, PROGRESS, AND SUCCESSIVE CHANGES, OF THE COMMON LAW FROM THE

the past was called a "bastardy proceeding."³⁰ Whether or not the father's identity was known was irrelevant to declaring a child a *bastard*. Even if the father came forward to claim the child as his own, the child still held the status of *bastard* because the test has always been the marital status—i.e., the unmarried state—of the mother at the time of birth.³¹

In ancient times, the solution to the problem of illegitimacy was simple: the pregnant unmarried or adulterous woman was executed.³² Old testament law required that an adulterer and adulteress be stoned to death.³³ Under such a public policy, there was never the legal need to establish paternity.

Roman society held a different attitude towards adultery and unmarried sexual relations among citizens.³⁴ Under Roman law, a Vestal Virgin who had lost her chastity was ceremoniously buried alive.³⁵ Capital punishment, however, was not the standard Roman punishment for the ordinary unchaste

EARLIEST PERIODS TO THE PRESENT TIME 89 (American ed. 1987). "Bastardy' may describe or define not only the condition of a bastard, or the condition of being an illegitimate child, but also the offense or act of begetting a bastard or illegitimate child." 10 C.J.S. *Bastards* § 1 (1938). See also BLACK'S LAW DICTIONARY 152 (6th ed. 1990). Today, the preference is to use the term "out-of-wedlock child" instead of the stigmatized term "illegitimate child".

³⁰See 10 C.J.S. *Bastards* § 1 (1938). See also BLACK'S LAW DICTIONARY 152 (6th ed. 1990). This is also known as a filiation or affiliation proceeding. *Id.*

³¹Obviously, this definition, based upon the status of a woman, was a practical and convenient method to test illegitimacy because status was a fact which could easily be proved. Traditionally, the proof problems associated with determining the biological father were quite onerous. See *infra* text at 12-20. However, the question of adulterine bastardy, where the child is born to a married—but adulterous—woman, complicates the definition of illegitimacy and the determination of paternity because of the presumption of legitimacy. See *infra* text at 13-16.

³²JENNY TEICHMAN, *ILLEGITIMACY: AN EXAMINATION OF BASTARDY* 53 (1982) ("Questions and difficulties about guardianship, custody and property of illegitimate children do not arise if illegitimate children are fated to die in their mother's wombs.").

³³"And the man who committeth adultery with another man's wife, even he who committeth adultery with his neighbor's wife, the adulterer and the adulteress shall surely be put to death." *Leviticus* 20:10. "If a man be found lying with a woman married to an husband, then they shall both of them die, both the man that lay with the woman, and the woman. . . . If a damsel who is a virgin be betrothed unto an husband, and a man find her in the city, and lie with her, [t]hen ye shall bring them both out unto the gate of that city, and ye shall stone them with stones that they die" *Deuteronomy* 22:22-24. Cf. *Deuteronomy* 22:28-29 ("If a man find a damsel who is a virgin, who is not betrothed, and lay hold on her, and lie with her, and they be found, [t]hen . . . she shall be his wife . . ."). Death was also the punishment for adultery under Islamic law. TEICHMAN, *supra* note 32, at 53.

³⁴See generally Robbins & Deak, *The Property Rights of Illegitimate Children: A Comparative Study*, 30 COLUM. L. REV. 308 (1930).

³⁵1 PLUTARCH, *LIVES OF THE NOBLE GRECIANS & ROMANS* 339, 345 (1914).

woman and thus many out-of-wedlock children were born.³⁶ Although Roman society recognized the right of existence of the out-of-wedlock child, Roman law nevertheless declared this child to be *filius nullius*—a child of no one—which precluded the child from asserting both support and succession rights.³⁷ It was possible, however, for the child to obtain these rights either through subsequent adoption or legitimation by the father.³⁸ But under Roman law there was no filiation action available to either the mother or child which could force the declaration of paternity and bestow its associated benefits.³⁹

Under Canon Law, illegitimacy was viewed as a condition imposed upon a child as a punishment for the sin of the parents who conceived the child out-of-wedlock.⁴⁰ Similar to Roman jurisprudence, the out-of-wedlock child could be legitimated by the subsequent marriage of the parents.⁴¹ Also, like Roman society, ecclesiastical society did not allow either the mother or the child to obtain a declaration of paternity.⁴² Thus, both ancient and medieval civilizations protected the putative father to the detriment of the mother and child by refusing to force the father to recognize his true biological relationship to those children born out-of-wedlock.

The concept of *filius nullius* was carried over to the English common law.⁴³ As such, the out-of-wedlock child could not seek support from either parent but instead had to join the ranks of the poor and destitute who depended on the parishes and boroughs for help.⁴⁴ This heavy burden placed on the parishes

³⁶TEICHMAN, *supra* note 32, at 53. These children were divided into two groups: the *nothi* and the *spurii*. The *nothi* were the children born to a concubine and these children had some legal claims on the father for support. The *spurii* were all other out-of-wedlock children, and these had no support rights whatsoever. *Id.*

³⁷See generally Robbins & Deak, *supra* note 34.

³⁸TEICHMAN, *supra* note 32, at 54.

³⁹It should be noted that although many illegitimate children were born in Roman society, the common practice of "exposing" unwanted infants to death significantly reduced the illegitimate population. Many of the *nothi*, particularly the female infants, and most of the *spurii* met this fate. *Id.* at 54.

⁴⁰JOHN HAMILTON BAKER, AN INTRODUCTION TO ENGLISH LEGAL HISTORY 263 (1971).

⁴¹TEICHMAN, *supra* note 32, at 54.

⁴²See generally R.H. HELMHOLZ, CANON LAW AND THE LAW OF ENGLAND (1987). See R.H. Helmholz, *Bastardy Litigation in Medieval England*, 13 AM. J. LEG. HIST. 360, 367-82 (1969).

⁴³See 1 WILLIAM BLACKSTONE, COMMENTARIES 447 (1769). See also R.H. Helmholz, *Support Orders, Church Courts, and the Rule of Filius Nullius: A Reassessment of the Common Law*, 63 VA. L. REV. 431 (1977). An illegitimate child was regarded by the court as a "stranger" to his parents. See *In re Lloyd*, 133 Eng. Rep. 1259 (C.P. 1841). Yet the "stranger" relationship was ignored by the court when marriage between parent and child was proposed; a father could not marry his illegitimate daughter nor a mother her illegitimate son. SCHATKIN, *supra* note 13, § 1.02(1).

⁴⁴TEICHMAN, *supra* note 32, at 60.

led to the Poor Law Act of 1576⁴⁵ which authorized justices of the peace to order the punishment of both the child's mother and the man responsible for fathering the *bastard*.⁴⁶ It also authorized a *bastardy* order requiring the mother, the putative father or both to make periodic payments "or other sustenation" for the relief of the child.⁴⁷

This was the beginning of the paternity suit in Anglo-American jurisprudence. Although the purpose of the Act was to impose support obligations on both the mother and the adjudicated father, it is important to note that the action began as a criminal—not civil—proceeding. Thus it was the general public who was to benefit from its enactment. Succeeding legislation was also designed to indemnify the public.⁴⁸ It was not until the nineteenth century that Parliament passed the New Poor Act of 1834⁴⁹ which modified the paternity suit dramatically by decriminalizing the status of the unmarried woman.⁵⁰ However, this Act put the liability of care directly on the mother and forbade her to sue the putative father.⁵¹ This disability did not last long because ten years later the proscription was lifted and the mother was allowed to directly seek support from the father for the benefit of the child.⁵² Thus, it was not until the middle of the nineteenth century that the paternity suit substantially developed into the action we know today under the common law.

Similarly, in the United States, the *bastardy* proceeding followed the common law or was modified by individual state statute. Notably, while most states authorized the paternity suit as a civil action, some states have maintained the criminal aspect of the common law action and have criminal remedies imposed upon a father who willfully neglects to support his out-of-wedlock child.⁵³ These statutes are not, however, criminal actions to punish out-of-wedlock procreation but use the paternity suit to prosecute the neglectful putative

⁴⁵18 Eliz. 1, ch. 3 (1576) (Eng.).

⁴⁶W.S. HOLDSWORTH, A HISTORY OF ENGLISH LAW 156-57 (3d ed. 1945). See also CRABB, *supra* note 29, at 503-04.

⁴⁷SCHATKIN, *supra* note 13, § 1.02(1).

⁴⁸*Id.* § 1.02(3).

⁴⁹An Act for the Amendment and better Administration of the Laws relating to the Poor in England and Wales, 4-5 Will. 4, ch. 76 (1834) (Eng.).

⁵⁰TEICHMAN, *supra* note 32, at 65.

⁵¹*Id.* The statute, however, did not preclude the boroughs and parishes from bringing suit against the putative father to either punish him or to enforce his support obligations. *Id.*

⁵²An Act for the further Amendment of the Laws relating to the Poor in England, 7 & 8 Vict., ch. 101 (1844) (Eng.). See SCHATKIN, *supra* note 13, § 1.02 (3).

⁵³E.g., *Timm v. State*, 54 N.W.2d 46 (Wis. 1952). Cf. *State ex rel. Samowski v. Fox*, 119 N.W.2d 451 (Wis. 1963) (mother's uncorroborated testimony, while not proof beyond a reasonable doubt, produces a guilty verdict against putative father).

father.⁵⁴ Nevertheless, both the civil and criminal case law relating to paternity determinations have demonstrated considerable variety, and even with the introduction of the Uniform Parentage Act and the Uniform Act on Paternity, American jurisdictions still differ on the basic determination elements as to the standards of proof and admissibility of evidence.⁵⁵

B. The Burdens, Presumptions And Evidence Of The Paternity Action

The burden of proving paternity has always been upon the one who brings the action (whether this was the man or the woman, an individual or a group) and it was upon the plaintiff to prove by either a preponderance of the evidence, by clear and convincing evidence, or by evidence beyond a reasonable doubt, depending upon the jurisdiction, that the putative father was the biological father of the child in question.⁵⁶ Some courts held that if a woman declared that she had sexual relations with the putative father, she had established a prima facie case, and the burden shifted to the defendant.⁵⁷ Other courts required corroboration of the woman's testimony to carry the burden forward and to shift it to the other party.⁵⁸ Nevertheless, whoever had the burden obviously had a most difficult problem of proof because of the lack of admissible physical evidence—or for that matter, of any physical evidence at all. In effect, the case would most often turn solely on which party told the more believable story. Thus, most paternity actions became nothing more than swearing contests before the trier of fact.⁵⁹

There were basically only two affirmative defenses available to the defendant.⁶⁰ The first was to show the incapability of having sexual relations

⁵⁴State v. Dixon, 127 S.E.2d 246 (N.C. 1962); State ex rel. Toryak v. Spagnuolo, 292 S.E.2d 654 (W. Va. 1982).

⁵⁵See supra note 14.

⁵⁶See Isaacson v. Obendorf, 581 P.2d 350 (Idaho 1978); People ex rel. Elkin v. Rimicci, 240 N.E.2d 195 (Ill. App. Ct. 1968); People v. Finks, 72 N.W.2d 250 (Mich. 1955); X v. Y, 482 P.2d 688 (Wyo. 1971). See also Jo-Dee Favre-Jones, Rivera v. Minnich: *Paternity Suits and the Negligible Burden of Proof*, 32 ST. LOUIS U. L.J. 803 (1988); Richard P. Perna, *The Uniform Reciprocal Enforcement of Support Act and the Defense of Non-Paternity: A Functional Analysis*, 73 KY. L.J. 75, 105-06 (1984); Traci Dallas, Note, *Rebutting the Marital Presumption: A Developed Relationship Test*, 88 COLUM. L. REV. 369, 370-72 (1988).

⁵⁷See, e.g., McGuire v. State, 326 P.2d 362 (Ariz. 1958); Medina v. Gonzales, 347 P.2d 138 (Colo. 1959); State ex rel. Sarnowski v. Fox, 119 N.W.2d 451 (Wis. 1963).

⁵⁸See, e.g., Lockman v. Fulton, 76 N.W.2d 452 (Neb. 1956); State ex rel. Klostermeier v. Klostermeier, 72 N.W.2d 848 (Neb. 1955).

⁵⁹Perhaps the extraordinary Supreme Court confirmation hearings of Justice Clarence Thomas focusing on the issues of sexual harassment best demonstrate the inherent problems of an action based on very little physical and testimonial evidence other than the spoken words of the principals.

⁶⁰It must be noted that the defendant could be (and usually was) the putative father; however the defendant could also be the biological mother or the father of record.

during the time of conception.⁶¹ Incapability was divided into two specific assertions. The first assertion of incapability was to prove that there was physical absence and/or spatial distance between the man and the woman so that neither party had "access" to one another during the time of conception.⁶² The second of the incapability assertions was to plead and prove that the man was impotent or sterile.⁶³

The other affirmative defense was the doctrine of *exceptio plurium concubentium* or the doctrine of multiple access.⁶⁴ If the defendant could prove that the mother had sexual relations with a man other than the putative father during the time of conception, the action would be dismissed as a matter of law.⁶⁵

Other than the prima facie case and the affirmative defenses, there were only two other significant procedural aspects of a traditional paternity action that both parties had to face. The first was the presumption of legitimacy, which if available to the defendant would cause the paternity suit to be dismissed.⁶⁶ The second was a trial technique known as "bald eagle" evidence which caused many emotional—though not very scientific—declarations of paternity.⁶⁷

1. The Presumption of Legitimacy

The presumption of legitimacy is an age-old doctrine which was applied whenever a paternity action involved a child who was born to a husband and wife during a valid marriage.⁶⁸ If the presumption was applicable, usually because the defense of incapability was unavailable, the action would be dismissed as a matter of law.⁶⁹ It is well often repeated that the presumption is

⁶¹SCHATKIN, *supra* note 13, § 1.05.

⁶²State *ex rel.* Munoz v. Bravo, 678 P.2d 974 (Ariz. 1984); Hanley v. Wilcox, 395 N.Y.S.2d 543 (App. Div. 1977); Gray v. Rose, 302 N.Y.S.2d 185 (App. Div. 1962).

⁶³Murdock v. Murdock, 480 N.E.2d 243 (Ind. Ct. App. 1985); Hanley v. Flanigan, 428 N.Y.S.2d 865 (Fam. Ct. 1980).

⁶⁴See Stephen L. Sass, *The Defense of Multiple Access (Exceptio Plurium Concubentium) in Paternity Suits: A Comparative Analysis*, 51 TUL. L. REV. 468 (1977).

⁶⁵Yarmark v. Strickland, 193 So. 2d 212 (Fla. Dist. Ct. App. 1966).

⁶⁶Of course, if it were proved that the husband had been incapacitated by nonaccess, sterility or impotency, the defendant would not have the benefit of the presumption. See *infra* notes 68-84 and accompanying text.

⁶⁷In the notorious case of *Berry v. Chaplin*, bald eagle evidence contributed to a jury disregarding the results of a blood test. See *Berry v. Chaplin*, 169 P.2d 442, 452 (Cal. Dist. Ct. App. 1946). See also *infra* notes 117-29 and accompanying text.

⁶⁸M. FIELD, SURROGATE MOTHERHOOD 122-25 (1988).

⁶⁹See Kevin L. Petrasic, Note, *Cutchember v. Payne: Approaching Perfection in Paternity Testing*, 34 CATH. U. L. REV. 227, 228 n.3 (Fall 1984).

one of the strongest in the law and most difficult to overcome.⁷⁰ Its purpose was grounded in the fundamental public policy that a legitimate child should not, sometime later on in life, be declared illegitimate. This policy was what prompted Chief Judge Lord Mansfield to state this most famous rule of evidence:

The law of England is clear that a declaration of a father or mother cannot be admitted to bastardize the issue born after marriage. It is a rule founded on decency, morality and policy that they shall not be permitted to say after a marriage that they have had no connection and therefore that the offspring is spurious.⁷¹

Still the best commentary on the presumption of legitimacy is found in the 1930 New York case of *In re Findlay*⁷² where Chief Judge Benjamin N. Cardozo, along with a unanimous New York Court of Appeals, held that "the presumption will not fail unless common sense and reason are outraged by a holding that it abides."⁷³ The case was not a paternity suit but a probate proceeding brought by the decedent's brother seeking to revoke letters of administration granted to the decedent's half-brother.⁷⁴ The surrogate court, by applying the presumption of legitimacy, found for the half-brother, and on appeal, the appellate court affirmed based on the strength of the presumption.⁷⁵

⁷⁰See *Bernheimer v. First National Bank*, 225 S.W.2d 745 (Mo. 1949); *Hanley v. Flanigan*, 428 N.Y.S.2d 865 (Fam. Ct. 1980); *Ewell v. Ewell*, 79 S.E. 509 (S.C. 1913). See also J. LONG, A TREATISE ON THE LAW OF DOMESTIC RELATIONS 252 (1923); W. WANENMACHER, CANONICAL EVIDENCE IN MARRIAGE CASES 244 (1935).

⁷¹*Goodnight v. Moss*, 98 Eng. Rep. 1258 (1777).

⁷²253 N.Y. 1 (1930).

⁷³*Id.* at 8.

⁷⁴The facts of this case illustrate why the presumption could not be permitted to stand. A woman had two families. *Id.* at 4-5. Her first family included two sons, Alfred and Albert Brooks, and her second family included another son, William Findlay. *Id.* Albert Brooks, at the age of nineteen, went to live with his mother and her second husband, and even changed his name to John Findlay. *Id.* at 5. This second marriage, however, was never valid since the first marriage had not been dissolved. *Id.* Many years later, when Albert Brooks—now legally known as John Findlay—died intestate, his half-brother William Findlay was made the administrator of the estate. *Id.* at 6. Full-brother Alfred Brooks sued, based upon the fact that William was not a full-blood relative. *Id.* William presented the ingenious argument that because the first marriage had never been dissolved, his father could only have been—under the presumption of legitimacy—Mr. Brooks and not Mr. Findlay. Thus, by applying the presumption, the surrogate court declared that William had to be a "Brooks" and not a "Findlay." *Id.* Therefore, he was the legitimate heir to the estate and qualified to be the administrator of the estate. *Id.*

⁷⁵*In re Findlay's Administrator*, 236 N.Y.S. 489, 497 (App. Div. 1929).

The Court of Appeals reversed the lower court by refuting the power of the presumption.⁷⁶ Judge Cardozo, in an articulate and well-reasoned opinion, began by acknowledging that

[p]otent, indeed, the presumption is, one of the strongest and most persuasive known to the law . . . and yet subject to the sway of reason. Time was, the books tell us . . . [that] if a husband, not physically incapable, was within the four seas of England during the period of gestation, the court would not listen to evidence casting doubt on his paternity. The presumption in such circumstances was said to be conclusive.⁷⁷

However, Cardozo discovered that there was English precedent which "exploded" the rule of the four seas "on account of its absolute nonsense."⁷⁸ He and the New York Court of Appeals would follow this other precedent and

abandoned the "nonsense" of the [presumption] We [will] no longer adhere to Lord Campbell's dictum . . . that a mulatto child born of a white mother must be ascribed to the white husband, and not to the black paramour, if the husband had access to his wife during the period of gestation.⁷⁹

The court, however, made it clear that it was not abandoning the presumption per se but merely the "follies and vagaries" inherent in the presumption.⁸⁰

Today the presumption of legitimacy is rebuttable, although the presumption is still strong in many jurisdictions.⁸¹ It may be rebutted by the traditional defense of incapability.⁸² Many jurisdictions now allow the presumption to fail by blood and tissue tests.⁸³ However, some states still impose procedural roadblocks to such a degree that the presumption is

⁷⁶*In re Findlay*, 253 N.Y. 1, 7 (1930).

⁷⁷*Id.* at 7.

⁷⁸*Id.* The English precedents contrary to the presumption were *Pendrell v. Pendrell*, 2 Strange 925 (1732) and *Rex v. Luffe*, 8 East 193 (1807).

⁷⁹*Id.* at 12-13.

⁸⁰*Id.*

⁸¹See, e.g., *McKenzie v. Harris*, 679 F.2d 8 (3d Cir. 1982) (applying Pennsylvania law); *Brown v. Danley*, 566 S.W.2d 385 (Ark. 1978); *Holland v. Holland*, 449 A.2d 1010 (Conn. 1982); *Happel v. Mecklenburger*, 427 N.E.2d 974 (Ill. App. Ct. 1981); *P.B.C. v. D.H.*, 483 N.E.2d 1094 (Mass. 1985); *State v. White*, 268 S.E.2d 481 (N.C. 1980); *Etchison v. Greathouse*, 596 S.W.2d 233 (Tex. Civ. App. 1980); .

⁸²*Haugen v. Swanson*, 16 N.W.2d 900 (Minn. 1949).

⁸³E.g., *Richardson v. Richardson*, 478 S.W.2d 423 (Ark. 1972); *Santiago v. Silva*, 413 N.E.2d 139 (Ill. App. Ct. 1980); *Beck v. Beck*, 304 N.E.2d 541 (Ind. Ct. App. 1973); *Simmons v. Simmons*, 479 S.W.2d 585 (Ky. 1972); *Commonwealth v. Stappen*, 143 N.E.2d 221 (Mass. 1957); *Shephard v. Shephard*, 265 N.W.2d 374 (Mich. Ct. App. 1978); *Groulx v. Groulx*, 103 A.2d 188 (N.H. 1954).

still—for all intents and purposes—conclusive.⁸⁴ Thus, some states continue to engage in a fiction by denying the recognition of true biological relationships.

2. Bald Eagle Evidence

The lack of tangible physical evidence in the traditional paternity suit perhaps is the reason why English and American courts allowed the admission of what is now called "bald eagle"⁸⁵ evidence. Simply put, *bald eagle* evidence is when the like or unlike resemblance between the child and the putative father is proffered as testimony or demonstrated to the jury. *Bald eagle* evidence can be traced to the ancient city of Carthage where children, upon reaching the age of two, were examined by a special committee; if their resemblance to the father was not great, they were killed.⁸⁶

Since the 1600s, English courts have allowed the admission of *bald eagle* evidence.⁸⁷ In the 1769 *Douglas Peerage Case*, which decided a delicate paternity question involving nobility, Chief Judge Lord Mansfield declared that he

always considered likeness as an argument of a child's being the son of a parent; and the rather as the distinction between individuals in the human species is more discernible than in other animals. A man may survey ten thousand people before he sees two faces perfectly alike; and in an army of a hundred thousand men every one may be known from the other. If there should be a likeness of features, there may be a discriminancy of voice, a difference in the gesture, the smile, and various other things; whereas a family-likeness generally runs through all these; for in everything there is a resemblance, as of features, size, attitude, and action. . . . It seems nature had implanted in the children what is not in the parents Among eleven black rabbits, there will scarce be found one to produce a white one.⁸⁸

In one eighteenth century case, the evidence of resemblance of the defendant father to the child was stated as "frequently fanciful, and therefore the jury should be well convinced that it did exist; *but if they were so convinced, it was*

⁸⁴*E.g.*, CAL. EVID. CODE § 621 (West 1991). This was the statute at issue in *Michael H. v. Gerald D.*, 491 U.S. 110, 117 (1989). *See supra* note 17.

⁸⁵This evidentiary method or trial technique is called "bald eagle" because it is based on the notion that if it looks like a bald eagle, then it probably is. This, of course, is a variation of the venerable "duck test." Statement by Emily Granrud, Oct. 14, 1991. *E.g.*, "[w]hereas it looks like a duck, and whereas it walks like a duck, and whereas it quacks like a duck, we therefore hold that it is a duck." *Dole v. Williams Enterprises*, 876 F.2d 186, 189 n.2 (D.C.C. 1989); *see also* *Loudermilk v. Loudermilk*, 397 S.E.2d 905 (W. Va. 1990). Applying this test to a paternity suit, the animal imagery of a bareheaded infant obviously lent itself more to the head of an eagle than to the head of a duck.

⁸⁶STRABO, GEOGRAPHY (circa 10 A.D.). *See also* SCHATKIN, *supra* note 13, § 3.08.

⁸⁷*See generally* 1A JOHN HENRY WIGMORE, EVIDENCE § 166 (Tillers ed. 1983).

⁸⁸*Douglas Peerage Case*, 2 Hargr. Collect. Jurid. 402 (1769).

impossible to have stronger evidence."⁸⁹ Resemblance has also been used as evidence of nonpaternity, such as in the case of *Morris v. Davies*⁹⁰ where the putative father defendant used the resemblance of the grown child to his wife's paramour to defend and defeat an action brought by that child for property rights.

As in early England, some American courts in the 1800s considered *bald eagle* evidence relevant, admissible and sometimes conclusive.⁹¹ In *Gilmanton v. Ham*, decided in 1859, the New Hampshire Supreme Court declared that

[t]he practice of bringing before the jury, on trials for bastardy, the child whose paternity is sought to be established, when living, has been almost universal in this State, from the earliest recollection of the oldest practitioners. . . . If the child were referred to at all, its general appearance, its complexion and features, might properly be commented upon; and we think under the well-established physiological law that like begets like, and that generally there is a striking resemblance . . . between the parent and the child.⁹²

Because *bald eagle* evidence was a trial technique unique to a paternity proceeding, it was recognized that there existed a grave potential for abuse of such evidence by a persuasive or sympathetic plaintiff.⁹³ It was argued that the jury could unjustly imagine the resemblance because they were persuaded by or had sympathy for the plaintiff or child. Thus, some American courts chose not to follow the precedent of the English decisions and found *bald eagle* evidence inadmissible.⁹⁴ One New England court, describing the ephemeral quality of an infant's features during the first few weeks or months of life, stated that

[w]hile it may be a well-known physiological fact that peculiarities of form, feature, and personality traits are oftentimes transmitted from parent to child, yet it is equally true as a matter of common knowledge that during the first few weeks, or even months of a child's existence, it has that peculiar immaturity of features which characterize it as an infant, and that it changes often and very much in looks and

⁸⁹Day v. Day (Assizes 1797) (quoted in NICHOLAS, TREATISE ON THE LAW OF ADULTERINE BASTARDY 140 (1836) and WIGMORE, *supra* note 87, § 166) (emphasis added).

⁹⁰3 C. & P. 214, 5 Cl. & F. 63 (1827, 1836).

⁹¹See Paulk v. State, 52 Ala. 427 (1875); Wright v. Hicks, 15 Ga. 160 (1854); Gilmanton v. Ham, 38 N.H. 108 (1859); Gaunt v. State, 14 A. 600 (N.J. 1888); State v. Britt, 78 N.C. 439 (1878); State v. Woodruff, 67 N.C. 89 (1872). See generally Courtney Kenny, *Physical Resemblance as Evidence of Consanguinity*, 39 LAW Q. REV. 297 (1923). See also WIGMORE, *supra* note 87, § 166.

⁹²Gilmanton v. Ham, 38 N.H. 108, 112-13 (1859).

⁹³WIGMORE, *supra* note 87, § 166.

⁹⁴See, e.g., State v. Danforth, 48 Iowa 43 (1878); Keniston v. Rowe, 16 Me. 38 (1839); Jones v. Jones, 45 Md. 144 (1876); Eddy v. Gray, 4 All. 435 (Mass. 1862).

appearance during that period. Resemblance can then be readily imagined. . . . And in a trial in bastardy proceedings the mere fact that a resemblance is claimed would be too likely to lead captive the imagination of the jury, and they would fancy they could see points of resemblance between the child and the putative father.⁹⁵

Today, the admissibility of *bald eagle* evidence has no uniformity whatsoever among the states, and it runs the full gamut from absolute competence to absolute incompetence. A few states flatly reject *bald eagle* evidence, whether by witnesses or exhibition, to the extent that there can be no mention or comparison of hair or eye color.⁹⁶ Some states allow the exhibition of the child but will not admit testimonial evidence of resemblance.⁹⁷ Other jurisdictions hold that both exhibition and testimonial evidence are admissible but only if the child is old enough to have well-defined features to make the comparison meaningful; this, however, can mean anywhere from two months to two years.⁹⁸ Some jurisdictions allow the child to be present in the courtroom so long as no comparisons to the putative father are attempted.⁹⁹ Some states do not allow evidence of a general resemblance but admit evidence comparing specific features.¹⁰⁰ One state admits *bald eagle* evidence only to show illegitimacy.¹⁰¹ Finally, there are those states which allow the trial court absolute discretion to admit such evidence.¹⁰²

Thus, it can be seen that *bald eagle* evidence greatly varies from jurisdiction to jurisdiction. Moreover, the certainty that the evidence will or will not be admitted is subject to change. For example, a court that otherwise excludes *bald eagle* evidence may permit expert testimony on resemblance by some certified

⁹⁵Clark v. Bradstreet, 15 A. 56 (Me. 1888).

⁹⁶Flores v. State, 73 So. 234 (Fla. 1916); Clark v. Bradstreet, 15 A. 56 (Me. 1888); Bilkovie v. Loeb, 141 N.Y.S. 279 (App. Div. 1913); Ratzloff v. State, 229 P. 278 (Okla. 1924).

⁹⁷Jones v. Jones, 45 Md. 144 (1876); Scott v. Donovan, 26 N.E. 871 (Mass. 1891).

⁹⁸State v. Harvey, 84 N.W. 535 (Iowa 1900) (*bald eagle* evidence allowed only if infant over two years old); State v. Danforth, 60 A. 839 (N.H. 1905) (*bald eagle* evidence admitted for an infant only a few months of age).

⁹⁹State v. Palmberg, 97 S.W. 566 (Mo. 1906); Ingram v. State, 37 N.W. 943 (Neb. 1888); Johnson v. State, 113 N.W. 674 (Wis. 1907).

¹⁰⁰*In re R.D.S.*, 514 P.2d 772 (Colo. 1973); Keniston v. Rowe, 16 Me. 38 (1839); Hall v. Centolanza, 101 A.2d 44 (N.J. Super. Ct. App. Div. 1953); Glascock v. Anderson, 497 P.2d 727 (N.M. 1972).

¹⁰¹Cannon v. Cannon, 7 Humph. 410 (Tenn. 1846).

¹⁰²Comish v. Smith, 540 P.2d 274 (Idaho 1977); State v. Kipers, 201 P. 68 (Kan. 1921); Dorsey v. English, 390 A.2d 1133 (Md. 1978). See also S.C. CODE ANN. § 20-7-956 (Law. Co-op. 1985) ("The following evidence is admissible at a hearing to determine paternity: . . . the court may view a child for the purpose of examining the presence or absence of physical characteristics and similarities between the child and putative father . . .").

specialist.¹⁰³ This could be particularly persuasive if the case is tried before a jury and not a judge because of the "expert nature" of the testimony.¹⁰⁴

Overall, *bald eagle* evidence has always been, and will continue to be, extremely dubious and dangerous evidence. The question is not whether the evidence is competent or even to what degree of competence it achieves. The issue is whether it is even necessary to decide the above question of admissibility at all. Likeness or unlikeness of resemblance between a child and father is a function of heredity, and there is no formula or scientific principle that states that a child must or must not look like its biological father. Although the likelihood of physical similarities exist, it is also possible that they may not. Therefore, this kind of evidence often appeals not to the sensibilities of the trier of fact, but to the emotions. *Bald eagle* evidence is a trial device used to get the child into the courtroom so as to present or create a pathetic and sympathetic situation.¹⁰⁵ This potential for abuse certainly outweighs any probative value.¹⁰⁶ Moreover, and most important, the issue of admissibility and weight is no longer valid because genetic marker testing achieves what *bald eagle* evidence had always sought to accomplish; that is, proof of genetic transference. Thus, the use of *bald eagle* evidence should be prohibited. It belongs upon the museum shelf of trial nonsense, right next to the spectral evidence once used at the Salem witchcraft trials.¹⁰⁷

III. BLOOD GROUP TESTING

A. Concept

As a forensic tool, blood group testing has existed for most of the twentieth century.¹⁰⁸ Unlike the European courts, however, American courts were slow

¹⁰³See, e.g., *In re R.D.S.*, 514 P.2d 772 (Colo. 1973); *Almeida v. Correa*, 465 P.2d 564 (Haw. 1970); *Commonwealth v. Kennedy*, 450 N.E.2d 167 (Mass. 1983); see also Unif. Parentage Act § 12(4), 9B U.L.A. 317 (1987 & Supp. 1992).

¹⁰⁴See, e.g., FED. R. EVID. 704 ("Testimony in the form of an expert opinion or inference otherwise admissible is not objectionable because it embraces an ultimate issue to be decided by the trier of fact.").

¹⁰⁵Indeed, it is not inconceivable that a woman or an individual in a governmental agency, with either malice or some other motive not related to the determination of paternity, could and would target a particular man based upon his physical resemblance to the child. The action would then become the unpredictable swearing contest if not for exclusion by blood or DNA testing.

¹⁰⁶See, e.g., FED. R. EVID. 403 ("Although relevant, evidence may be excluded if its probative value is substantially outweighed by the danger of unfair prejudice, confusion of the issues, or misleading the jury . . .").

¹⁰⁷DAVID THOMAS KONIG, *LAW & SOCIETY IN PURITAN MASSACHUSETTS: ESSEX COUNTY, 1629-1692* 171-72 (1979) (Witch trial procedures permitting admission of evidence obtained from "spectral sources," such as apparitions seen by the accusers, "has been cited as the most irrational, uncontrollable, and barbaric aspect of the entire witchcraft episode.").

to accept the evidentiary value of these tests and at first excluded them entirely.¹⁰⁹ Eventually, the tests were admitted on a limited basis, but it was not until the 1940s that blood group testing was accepted as accurate and evidentially competent.¹¹⁰

The scientific principle behind the blood group test is simple: blood can be distinguished because it contains different antigens.¹¹¹ These antigens may be detected by performing a series of chemical tests.¹¹² Once these antigens are detected, the blood may be classified into different groups. For example, in the commonly known ABO blood grouping system, blood containing antigen A is Group A, blood containing antigen B is Group B, blood containing both antigens is Group AB, and blood which does not contain any antigens is Group O.

In a criminal investigation, blood found at the scene of a crime may be tested and compared to the victim's blood group and to a suspect's blood group.¹¹³ A match between the crime scene blood group(s) and the suspect's blood group means that it is possible the blood found at the crime scene belongs to the suspect. This possibility becomes greater if the victim's blood group and the suspect's blood group are different because the blood could not belong to the victim. Thus, this test becomes more meaningful when the victim's blood group does not match the crime scene blood group(s). However, if the suspect's blood group or the victim's blood group does not match the crime scene blood group(s), by the concept of exclusion and based upon the blood evidence, it is unlikely that the suspect was at the crime scene unless it is thought that the crime was committed by more than one individual.¹¹⁴

¹⁰⁸The first blood test was performed in 1900 by Dr. Karl Landsteiner in Vienna, Austria. See generally John P. Ludington, Annotation, *Admissibility and Weight of Blood-Group Tests in Disputed Paternity Cases*, 43 A.L.R.4th 597 (1985); R.D. Hursh, Annotation, *Blood Grouping Tests*, 46 A.L.R.2d 1000 (1956); E.H. Turri, Annotation, *Blood-Grouping Tests*, 163 A.L.R. 939 (1946).

¹⁰⁹See, e.g., *Commonwealth v. English*, 186 A. 298 (Pa. Super. Ct. 1936).

¹¹⁰See *Williams v. State*, 197 So. 562 (Fla. 1940); *Shanks v. State*, 45 A.2d 85 (Md. 1945); *Jordan v. Davis*, 57 A.2d 209 (Me. 1948); *Schulze v. Schulze*, 35 N.Y.S.2d 218 (Sup. Ct. 1942); *State v. Clark*, 58 N.E.2d 773 (Ohio 1944); *State v. Wright*, 17 N.E.2d 428 (Ohio 1938); *State v. Damm*, 266 N.W. 667 (S.D. 1936); *Euclid v. State*, 286 N.W. 3 (Wis. 1939).

¹¹¹Specifically, an antigen is a foreign substance in the blood which is usually a protein, at least in part, and may be some plant or animal protein, a bacterial toxin, the protein of a virus coat, or may be derived from pollen. GEORGE W. BURNS & PAUL J. BOTTINO, *THE SCIENCE OF GENETICS* 346 (6th ed. 1989).

¹¹²The testing method is quite simple. Blood can be separated into red blood cells and serum. If serum of a known grouping is mixed with unknown red blood cells, agglutination (clumping) may occur. Whether or not agglutination occurs indicates the presence or absence of antigens in the red blood cells. SCHATKIN, *supra* note 13, § 5.02.

¹¹³MCCORMICK, *supra* note 8, § 205.

¹¹⁴In this example, it must be assumed that the crime scene blood could only belong to either the victim or the suspect and not to some other third party.

This concept of exclusion is likewise applicable to determinations of paternity. The blood test, however, achieves a much greater significance because here the determination does not prove the mere presence of the party but goes to the very essence of the action. The science of genetics states that a child's blood group is a hereditary trait acquired from either or both parents.¹¹⁵ Thus, a Group O mother and a Group O father can only produce a Group O child because neither the A nor B antigen is present in either parent. Moreover, a Group A mother and a Group O father could only produce either a Group O or a Group A child, because all other groups would require the presence of the B antigen in one of the parents.¹¹⁶ If a Group B child were born to a Group A mother, it would be impossible for a Group O man to be the father because he would be lacking the B antigen, and such a paternity action should be dismissed by the court.

Dismissal, however, did not happen in the notorious 1945 Hollywood case of *Berry v. Chaplin*,¹¹⁷ where Charles Spencer Chaplin, better known to the world as Charlie Chaplin, was found by the jury to be the father of Carol Ann Berry. Although blood grouping tests had been introduced to American courts in the 1930s and were used in some jurisdictions as exclusionary evidence of paternity,¹¹⁸ in 1937 the California Supreme Court held in *Arias v. Kalensnikoff*

¹¹⁵Even before the discovery of DNA, or of the gene, or of the intricate nature of the chromosome, the twentieth century had accepted the principles of Mendelian inheritance based upon the famous pea experiments performed by the Austrian monk in the 1850s. For a general discussion of Gregor Mendel and the Mendelian gene see GEORGE J. BREWER & CHARLES F. SING, *GENETICS* 294-341 (1983); MARJORIE W. FARNSWORTH, *GENETICS* 1-55 (2d ed. 1988); BURNS & BOTTINO, *supra* note 111, at 1-70.

¹¹⁶Below are the total combination possibilities of the ABO system:

PARENTS' BLOOD GROUP	OFFSPRING'S BLOOD GROUP	
	May Be	Cannot Be
AB + AB	AB, A or B	O
AB + A	AB, A or B	O
AB + B	AB, A or B	O
AB + O	A or B	AB or O
A + A	A or O	AB or B
A + B	AB, A, B or O	No Group Impossible
A + O	A or O	AB or B
B + B	B or O	AB or A
B + O	B or O	AB or A
O + O	O	AB, A or B

¹¹⁷There is no available cite for this case at the trial level. See *Berry v. Chaplin*, 169 P.2d 442 (Cal. Dist. Ct. App. 1946). See also SCHATKIN, *supra* note 13, § 9.19.

¹¹⁸See *supra* note 110.

that exclusion by blood group testing was not decisive of the issue of paternity and had to be weighed together with all other evidence which constituted "ample evidence to support the finding of parentage."¹¹⁹ This meant that a jury could find Charlie Chaplin, Group O, to be the father of a Group B child, Carol Ann Berry, whose mother, Joan Berry, was Group A.¹²⁰ The verdict was against the comedian even though there was evidence indicating that the mother had relations with several other men.¹²¹ After the trial, juror's comments included that "Mr. C was so nervous on the witness stand [that he] overacted his part" and that Charlie Chaplin "had no evidence to prove that he was not the father."¹²² One juror stated that "the evidence showed that he not only had the opportunity [to be the father] but took advantage of it."¹²³

On appeal, the California District Court of Appeal affirmed, citing *Arias* as controlling.¹²⁴ While the court conceded the "immutability of the scientific law of blood-grouping," it went on to state that the "infallibility of the results of blood tests depends on the skill employed in making them."¹²⁵ Thus, the court reasoned that blood test evidence was to be treated like any other evidence which conflicts with other testimony and should therefore be weighed by the trier of fact. According to the appeal court, the jury had properly weighed the evidence and had permissibly disregarded the test.¹²⁶

¹¹⁹*Arias v. Kalensnikoff*, 74 P.2d 1043, 1047 (Cal. 1937).

¹²⁰*Berry*, 169 P.2d at 445, 451-53.

¹²¹*Id.* at 449-50; See also SCHATKIN, *supra* note 13, § 9.19.

¹²²*Chaplin Declared Father of Child*, N.Y. TIMES, Apr. 18, 1945, at 25. This was the second trial of the same paternity determination. The first trial ended in a mistrial because the 7 to 5 split decision in Chaplin's favor was 2 short of the required 9 votes to decide a civil case. *Id.* The second trial was against the comedian 11 to 1. A burst of applause and cheers came from some 30 spectators after the verdict was read. The lone dissenting juror, a 65-year old housewife named Mrs. Mary H. James, stated that she was "not upholding Mr. Chaplin at all—I want that understood, only I don't think he was the father of the child." *Id.*

¹²³*Id.* The jury verdict in the Chaplin case caused a nationwide stir and generated a vociferous public outcry. For example, an editorial in the *Boston Herald* declared that "[u]nless the verdict is upset, California has in effect decided that black is white, two and two are five, and up is down." BOSTON HERALD, Apr. 19, 1945, at 24. Just the year before, Chaplin had been acquitted of charges by a federal court jury that he had violated the Mann Act; it had been alleged that he had transported Ms. Berry, his purported acting student, across state lines for immoral purposes. Ms. Berry has previously been convicted of vagrancy. See *United States v. Chaplin*, 54 F. Supp. 682 (S.D. Cal. 1944); *United States v. Chaplin*, 54 F. Supp. 926 (S.D. Cal. 1944).

¹²⁴*Berry*, 169 P.2d at 451.

¹²⁵*Id.* Thus, the court allowed scientific fact to be disregarded by the jury.

¹²⁶The jury also disregarded evidence which showed Joan Berry to be involved with three other men and that they all had access during the time of conception. *Berry*, 169 P.2d at 449-50. One of these men, Paul Getty, ostensibly "loaned" her significant sums of money through his attorney. SCHATKIN, *supra* note 13, § 9.19.

We present this case in detail to illustrate how grave miscarriages of justice may happen if scientific evidence is merely weighed by the jury. While there can be no disagreement that a collateral attack upon the manner, method and procedure used to render the test would always be proper,¹²⁷ the position of the California Supreme Court in the 1930s and 1940s was that the results of a blood group test should be regarded merely as expert opinion.¹²⁸ This viewpoint was, of course, completely misplaced because reputable and qualified serologists would not differ on the result of a blood grouping test.¹²⁹ Therefore, to allow a trier of fact the discretion of rejecting scientific fact is ludicrous. In *Berry v. Chaplin*, the emotions inherent in a paternity suit, fostered by the reputation of the defendant, influenced by the *bald eagle* evidence, and buttressed by the defendant's sexual access and inclinations overcame the sensibilities of scientific principles. Had Charlie Chaplin not been excluded, then it was up to the jury to decide his liability to Joan and Carol Ann Berry. But once he was excluded, the inquiry at that point should have stopped.

¹²⁷See *People v. Castro*, 545 N.Y.S.2d 985 (Sup. Ct. 1989) for what some consider to be a modern variation of *Berry v. Chaplin* regarding scientific evidence and its admissibility and weight. *Castro* used a three-prong analysis to determine if DNA profiling was admissible: (1) whether there was a theory generally accepted in the scientific community which supports the conclusion that DNA profiling can produce reliable results; (2) whether there were techniques or experiments that currently exist capable of producing reliable results in DNA identification and which are generally accepted in the scientific community; and (3) whether the testing laboratory performed the accepted scientific techniques in analyzing the forensic samples of this particular case. *Id.* at 987. It was the failure of the third prong that made the DNA evidence inadmissible as a matter of law in *Castro*. *Id.* at 999.

¹²⁸The tension between blood tests being irrefutably conclusive or simply being regarded as a matter of an expert's opinion was somewhat mitigated several years later by a middle-tier position presented in *Ross v. Marx*, 93 A.2d 597 (N.J. Super. Ct. App. Div. 1952). The court followed and cited a statement by the American Medical Association regarding the legal conclusiveness of blood tests:

While the results of the blood tests are admissible when they exclude paternity, the findings are not binding on the court. That is as it should be. It is the duty of the court to examine the evidence in order to convince itself that the tests have been properly carried out by qualified experts. When the court feels that adequate safeguards have not surrounded the tests, it should order the tests to be repeated by an independent expert, and there is nothing to prevent shipping of the blood to another part of the country if there is no qualified expert in the state in which the case is being tried. . . . To base decisions entirely on the results of a blood test in such cases may harm an innocent third party by bastardizing the child.

Id. at 599 (quoting *Medicolegal Application of Blood Group Testing*, 149 JAMA 699, 703 (1952)). It appears that while the tests were not to be considered conclusive, it was the court's duty to make sure that the tests were properly performed. An improperly performed test was not so much simply deemed inadmissible or given little weight, it caused the court to order another test. Thus, the tests were repeated until the results became—for all practical purposes—conclusive.

¹²⁹SCHATKIN, *supra* note 13, § 9.19.

Since the discovery of the ABO blood grouping test in 1900, a multitude of different blood grouping tests have been discovered and forensically applied: significantly, MNSs (1927), P (1927), Rh (1939), Kell (1946), Duffy (1950), Kidd (1951), HLA (1958), and a wide range of enzymes and serum proteins.¹³⁰ Of most significance is the Human Leukocyte Antigen ("HLA") test.¹³¹ Unlike all other blood group tests which test for antigens found in the red blood cells, HLA testing focuses on the white blood cell. While the different red blood cell tests can identify a small number of antigens, HLA testing can identify twenty-one genetic markers.¹³² This makes the HLA test far superior when compared to all the other blood grouping tests.¹³³

These tests are now collectively known as genetic marking tests.¹³⁴ With such a wide array of genetic markers, it is now possible to ascertain a scientifically reliable probability figure in determining paternity. The question then becomes how the probability "fact" is applied to a paternity determination.

B. *The Mathematics Of The Probability Of Paternity*

Paternity as evidenced by a genetic marking test may be expressed by either an exclusion or inclusion probability. Each may be expressed as a percentage, a ratio or merely as the odds that the putative father is or is not the biological father. Nevertheless, no matter how the probability is expressed, it is essential that the legislators, the judges and the lawyers all understand what the terms and the numbers mean.¹³⁵

¹³⁰*Id.* § 8.08. See also LEON M. SUSSMAN, BLOOD GROUPING TESTS (1st ed. 1968); ROBERT RUSSELL RACE & RUTH SANGER, BLOOD GROUPS IN MAN (6th ed. 1976).

¹³¹See Linda L. Lemmon & Lyon K. Murphy, *The Evidentiary Use of the HLA Blood Test in Virginia*, 19 U. RICH. L. REV. 235 (1985); Patricia Bendschuh Blumberg, Note, *Human Leukocyte Antigen Testing: Technology Versus Policy in Case of Disputed Parentage*, 36 VAND. L. REV. 1587 (1983); Francine Protogere, *Use of Human Leukocyte Antigen Test Results to Establish Paternity*, 14 IND. L. REV. 831 (1981); Randolph N. Jonakait, *Will Blood Tell? Genetic Markers in Criminal Cases*, 31 EMORY L.J. 833 (1982). See generally Jean E. Mass, Annotation, *Admissibility, Weight and Sufficiency of Human Leukocyte Antigen (HLA) Tissue Typing Tests in Paternity Cases*, 37 A.L.R.4th 167 (1985).

¹³²ABO (4 antigens); MNSs (3 antigens); Rh (7 antigens); Kell (2 antigens); Duffy (2 antigens); Kidd (2 antigens); and P (1 antigen). SCHATKIN, *supra* note 13, § 8.04.

¹³³*Id.* § 8.08.

¹³⁴For an informative look at the standards of blood group testing in disputed parentage cases see *Joint AMA-ABA Guidelines: Present Status of Serologic Testing in Problems of Disputed Parentage*, 10 FAM. L.Q. 247 (1976).

¹³⁵This Article cannot fully develop the various statistical and probability theories inherent in this issue. For a full and complete understanding, see LAURENCE TRIBE, TRIAL BY NUMBERS; D.H. Kaye, *The Probability of an Ultimate Issue: The Strange Cases of Paternity Testing*, 75 IOWA L. REV. 75 (1989); Ira Mark Ellman & David Kaye, *Probability and Proof: Can HLA and Blood Group Testing Prove Paternity?*, 54 N.Y.U. L. REV. 1131 (1979); Robert W. Peterson, *A Few Things You Should Know About Paternity Testing But Were Afraid to Ask*, 22 SANTA CLARA L. REV. 667 (1982); R.C. Elston, *Probabilities and Paternity Testing*, 39 AM. J. HUM. GENETICS 112 (1986). See also *State v. Schwartz*, 447 N.W.2d 422 (Minn.

The Probability of Exclusion ("POX") has two distinct meanings.¹³⁶ First, it refers to the ability that a single test can exclude a random man.¹³⁷ For example, if only the ABO test existed, and Group O blood occurred in sixty percent of the same-race¹³⁸ male population, the probability of excluding a randomly picked man testing only for Group O is two to five or forty percent since the blood of forty percent of the population would contain either the A and/or B antigens and would test negative for Group O. Actually, under the complete ABO blood grouping system, the true chance of exclusion, and thus exonerating a falsely accused man, is approximately twenty percent.¹³⁹ Thus, theoretically, if a hundred random men were accused of fathering a specific child, the POX resulting from an ABO blood test should conclusively eliminate twenty men.

POX also refers to the percentage of falsely accused men who would be excluded by the battery of test runs performed by a specific laboratory.¹⁴⁰ It is the measure of the ability of a laboratory to detect non-fathers based on the genetic systems the laboratory studies.¹⁴¹ In other words, this figure denotes what percentage of the population can be excluded using all the tests available to the laboratory. If we begin with the ABO system exclusion figure of twenty percent, and we introduce another genetic marking test, such as the MNSs test which has a 31.6% exclusion, the overall exclusion rate would be increased to 45.3%.¹⁴² Today, with HLA testing (but excluding DNA testing) the overall exclusion rate is 99.85%.¹⁴³ This means that 99.85% of all falsely accused men

1989); *Rivera v. State*, 840 P.2d 933 (Wyo. 1992). We do advocate a uniformity in the applied theory.

¹³⁶See *State ex rel. Hausner v. Blackman*, 648 P.2d 249 (Kan. Ct. App. 1982); E.G. Reisner & T.A. Bolk, *A Layman's Guide to the Use of Blood Group Analysis in Paternity Testing*, 20 J. FAM. L. 657 (1982). See generally MCCORMICK, *supra* note 8, § 211.

¹³⁷Since a putative father must be of the male gender, the term "random man"—not "random person"—is used.

¹³⁸Most probability of paternity calculations are premised on the fact that the race of the putative father is either known or can be pre-determined.

¹³⁹SCHATKIN, *supra* note 13, § 8.04.

¹⁴⁰*Paternity Testing*, Biomedical Reference Laboratories, Inc. (technical bulletin 1982). See also MCCORMICK, *supra* note 8, § 211 n.4.

¹⁴¹See, e.g., *Sutton v. Eddy*, 828 S.W.2d 56, 58 (Tex. Ct. App. 1991) (paternity blood test result "reflected a 95.26% power of exclusion and a 99.44% probability of [putative father's] paternity . . .").

¹⁴²The formula for calculating the probability of exclusion is:

$$P = 1 - (1 - P1) (1 - P2) (1 - P3) \dots$$

where P is the composite probability of exclusion, P1 is the probability of exclusion in one system, P2 is the probability of exclusion in the second system, P3 is the probability of exclusion in the third system, etc. Thus $1 - (1 - .2) (1 - .316) = 1 - (.8) (.684) = 1 - .547 = .453$. LEON N. SUSSMAN, *PATERNITY TESTING BY BLOOD GROUPING* 8-9 (2d ed. 1976).

¹⁴³SCHATKIN, *supra* note 13, § 8.08.

will be excluded and therefore exonerated by these battery of tests. Thus, theoretically, if a hundred random men were accused of fathering a specific child, the POX resulting from a laboratory's prowess to conduct conclusive paternity tests would conclusively eliminate ninety-nine men.

Whether the term "POX" is used to refer to the ability of a single test to exclude or the ability of a laboratory to exclude, the legal result of an exclusion is nonetheless the same: that it is scientifically impossible for a putative father who is excluded by any one test to be the biological father. Thus, there is a third meaning to POX when applied to a putative father who has been excluded by any one test; in such a case that person's POX is 100 percent. Although all courts now accept a 100 percent POX as conclusory, there is some misunderstanding as to the application of the term. Some courts have misunderstood that, for example, while the ABO test can only exclude twenty percent of randomly selected men, once a man is excluded the POX—for that particular suspect—become 100 percent.¹⁴⁴

If the POX does not exclude the putative father, then the Probability of Paternity ("POP") that the putative father is the biological father is calculated. The POP is an estimate of the likelihood that the putative father is the biological father of the child.¹⁴⁵ It is determined by calculating the chance that the putative father could produce a single sperm containing all the genetic information a given child must have received from its biological father, as compared to the chance that a random unrelated man of the same-race could provide the necessary genetic information. Most often the POP is expressed as an odds ratio called the Paternity Index ("PI") which is then translated to a percentage. This odds ratio operates under the principle of Bayes' formula whereby any putative father begins with the neutral odds of one to two or fifty percent.¹⁴⁶ In other words, it is exactly even that the defendant is or is not the father. Genetic testing will then either lower the odds to zero by exclusion or increase the odds above fifty. For example, if the gene frequencies of the defendant is fifty times more likely to produce the actual child than the random

¹⁴⁴See MCCORMICK, *supra* note 8, § 211 n.4.

¹⁴⁵Here again, the terminology has become muddled and the courts have mixed up or misapplied the terms "probabilities," "possibilities," "plausibility," and "likelihood." See, e.g., *County of Ventura v. Marcus*, 189 Cal. Rptr. 8 (Cal. Ct. App. 1983); *Carlyon v. Weeks*, 387 So. 2d 465 (Fla. Dist. Ct. App. 1980); *State ex rel. Buechler v. Vinsand*, 318 N.W.2d 208 (Iowa 1982); *Tice v. Richardson*, 644 P.2d 490 (Kan. Ct. App. 1982); *Williams v. Olden*, 561 So. 2d 871 (La. Ct. App. 1990); *Kammer v. Young*, 535 A.2d 936 (Md. Ct. Spec. App. 1988); *Frederick v. Burke*, 397 N.W.2d 19 (Minn. Ct. App. 1986); *State ex rel. Division of Family Servs. v. Guffey*, 795 S.W.2d 546 (Mo. Ct. App. 1990); *State ex rel. Williams v. Williams*, 609 S.W.2d 456 (Mo. Ct. App. 1980).

¹⁴⁶The high court of one state will not permit trial courts to automatically accept Bayes' Theorem in a criminal action. *Sate v. Spann*, 617 A.2d 247 (N.J. 1993). For a discussion of Bayes' Theorem see Peterson, *supra* note 131, at 681-83; MCCORMICK, *supra* note 8, § 211 n.16. See also Randolph N. Jonakait, *When Blood is Their Argument: Probabilities in Criminal Cases, Genetic Markers, and, Once Again, Bayes' Theorem*, 1983 U. ILL. L. REV. 369 (1983).

man of the same-race, then the PI is fifty to one, or ninety-eight percent. Simply put, this indicates that the chance of finding a random unrelated man of the same-race as the alleged father also capable of contributing a sperm with the required genes is one in every fifty or fifty-one individuals.¹⁴⁷ Since the PI calculation is based upon the frequencies of the relevant genes in the random population, it becomes significantly useful only when an appropriate number of genetic systems are selected for and tested.

The POX and POP expressions are very misleading to the trier of fact.¹⁴⁸ The POX and POP probability concepts are independent concepts and are mathematically *unrelated*.¹⁴⁹ A testing laboratory's methodology is to run a battery of tests in order to exclude the alleged father. If exclusion occurs based on the absence of necessary genetic information, then the testing ceases and the POX is 100 percent. If exclusion does not occur, then more tests are introduced. Eventually, if exclusion still does not occur, the POP is calculated based on the frequency which the specific gene or genes occurs in the general population. However, this calculation may sound weightier than it is. For example, a PI of five thousand to one would translate to a probability of paternity of 99.98%.¹⁵⁰

¹⁴⁷This is one of the problems that the statisticians and probability mathematicians need to iron out for the legislators and the courts. Does 50:1 mean 1 out of a group of 50 or 1 out of a group of 51. If it means 1 out of 50, then 98% (49/50) would be the proper percentage, but if it means 1 out of 51 then 98.0392% (50/51) would be the correct percentage. See Kaye, *supra* note 135, at 87-108.

¹⁴⁸See *Commonwealth v. Beausoleil*, 490 N.E.2d 788 (Mass. 1986).

¹⁴⁹*Paternity Testing*, *supra* note 140.

¹⁵⁰The following table shows the PI to percentage relationships using both percentage formulations:

X:Y	$(X - Y)/X$	$X/(X + Y)$
10:1	90.000000%	90.9090909%
50:1	98.000000%	98.0392000%
100:1	99.000000%	99.0099010%
500:1	99.800000%	99.8003992%
1000:1	99.900000%	99.9000999%
2000:1	99.950000%	99.9500250%
5000:1	99.980000%	99.9800040%
10,000:1	99.990000%	99.9900010%
100,000:1	99.999000%	99.9990000%
1,000,000:1	99.999900%	99.9999000%
10,000,000:1	99.999990%	99.9999900%
100,000,000:1	99.9999990%	99.9999990%

Yet courts are reluctant to find paternity based on such figures because in a city with a same-race male population of 500,000, or even 500,001, one hundred other men might theoretically be the father.¹⁵¹ Taking this to a global scale, if there are 500 million men of the same-race on the planet, 100,000 men might theoretically qualify as putative fathers. Of course, out of these 100,000 possible fathers scattered over the face of the planet, the likelihood that the true father will be named the respondent in a paternity action is astronomically high. However, the fact remains that paternity indexes are not mathematically solid enough for many courts, primarily based on due process concerns, to accord conclusive weight of paternity.¹⁵²

Therefore, it is necessary to establish a uniformity when interpreting the POP so that courts may understand the value of the statistic and accord it the proper weight. Currently, for purposes of inclusion, while it appears that no court would hold a genetic marker test used to prove the possibility of paternity as completely inadmissible,¹⁵³ many courts merely allow it into evidence and let

¹⁵¹Recently, a New York court was sharply divided on the weight to assign a DNA paternity test. *Debra L. v. William J.*, 1993 N.Y. App. Div. LEXIS 2271 (App. Div. 1993). The majority stated that "[a]ccording to the expert testimony given at the hearing, the combined indices [HLA and DNA] resulted in a value of 2,984,773 to 1, or 99.99+%, in favor of the respondent's paternity, the sort of figures one court has called 'staggering' [citations omitted]." *Id.* Based on the combination of the HLA and DNA test, the court concluded that the "petitioner had met its burden of proving respondent's paternity by 'clear and convincing proof' [citation omitted]." *Id.* The minority, on the other hand, stated that

[w]hile it is true that the results of the HLA test are highly probative, they are not conclusive [citations omitted]. The results of the additional DNA test which was taken do not render the combination of tests conclusive, as conceded by the majority. Such test results are only one item of evidence among many which the trier of facts has at its disposal to aid in the determination, and the results need only be given such weight as the trier of facts deems appropriate [citations omitted].

Id. Two New York Family Court judges have rejected a conclusive presumption of paternity although one would permit a rebuttable presumption of paternity.

"If the paternity index indicates that there is any chance that the respondent is not the father, then we would try the case to decide the issue in order to guarantee the respondent's right to due process." Interview with Hon. George D. Marlow, former Family Court (now Dutchess County Court) Judge, Dutchess County, New York, in Poughkeepsie, N.Y. (June 24, 1991).

I believe a trial is required whenever a respondent contests paternity.

I do not believe that odds of 1 out of 10,000 are acceptable for a rebuttable presumption of paternity; however, if the odds were 100,000 to 1, or better, I would be comfortable with a rebuttable presumption of paternity.

Interview with Hon. Damian Amodeo, Family Court Judge, Dutchess County, New York, in Poughkeepsie, N.Y. (July 24, 1991).

¹⁵²See *supra* note 151.

¹⁵³State *ex rel.* Hausner v. Blackman, 662 P.2d 1183 (Kan. 1983); Pizana v. Jones, 339 N.W.2d 1 (Mich. Ct. App. 1983).

the trier of fact weigh its probative value.¹⁵⁴ Other states have instituted statutes to create rebuttable presumptions even if the PI is as low as 20 to 1.¹⁵⁵ Yet overall, courts are hesitant to make such conclusive findings based on evidence of inclusion.¹⁵⁶ Only by creating a uniformity of interpretation will the POP be just and fair to all putative fathers. Moreover, now with DNA profiling, the POP has become so precise that its meaning should be acknowledged by all courts. Thus, it is now necessary to legislate the POP with particularity into the paternity statutes so that the courts may properly and legally apply this precision to future paternity actions.

IV. DNA TECHNOLOGY AND METHODOLOGY

The discovery of the DNA molecule in 1953 by James Watson and Francis Crick is probably one of the—if not the—greatest scientific achievements of the twentieth century.¹⁵⁷ This discovery has profoundly affected every branch of the biological sciences and has opened the doors to biochemical and genetic engineering. It should be noted that the use of DNA technology by forensic science is a mere minor by-product of DNA research. Nevertheless, DNA research has provided a means to distinguish all individuals, except identical twins, by simply analyzing a tiny piece of biological material.¹⁵⁸

The paternity action for the next century should be based on this new technology. When combined with other genetic marking tests, such as standard blood grouping tests and HLA tests, the Probability of Paternity can be raised to a Paternity Index of over a hundred million to one, or above 99.999999 percent.¹⁵⁹ In order to appreciate the precision of DNA testing, it is important

¹⁵⁴Davis v. State, 476 N.E.2d 127 (Ind. Ct. App. 1985); Smith v. Price, 340 S.E.2d 408 (N.C. 1986); Smith v. Shaffer, 515 A.2d 527 (Pa. 1986).

¹⁵⁵ARK. CODE ANN. § 9-27-342(h)(2)(B) (Michie 1992); FLA. STAT. ch. 742.12(1) (1991); MONT. CODE ANN. § 40-5-234(3)(b) (1992); OHIO REV. CODE ANN. § 3111.03(A)(5) (Anderson 1992); OKLA. STAT. ANN. tit. 10, § 504(C) (West 1991).

¹⁵⁶It should be noted that the United States Supreme Court has—at least indirectly—acknowledged the validity of the POP in Clark v. Jeter, 486 U.S. 456 (1988).

¹⁵⁷See JAMES D. WATSON, THE DOUBLE HELIX: A PERSONAL ACCOUNT OF THE DISCOVERY OF THE STRUCTURE OF DNA (1969). Both scientists won the Nobel prize in 1962 for their discovery of the helical structure of DNA.

¹⁵⁸While this is often referred to as a "DNA fingerprint," it is misleading to think that DNA is "matched" in the same manner as two sets of fingerprints are matched. DNA profiling is used to exclude suspects, first by one test, then by another, and if the suspect is not excluded after a battery of these tests, then a probability of inclusion is calculated. Although DNA profiling and classic fingerprint analysis are conceptually similar, the similarities are—in the longrun—only slight. See Commonwealth v. Curmin, 565 N.E.2d 440, 441 n.2 (Mass. 1991).

¹⁵⁹See Andrews v. State, 533 So. 2d 841, 845 (Fla. Dist. Ct. App. 1988) (expert testimony that DNA test showed one in 800 million chance that defendant was not victim's rapist or a probability of inclusion of 99.9999988%); King v. Tanner, 545 N.Y.S.2d 649, 651 (Sup. Ct. 1989) (HLA test showed probability of paternity to be 99.98% while DNA test showed probability of paternity to be 99.993%); *In re Adoption of Baby Girl S*, 532 N.Y.S.2d 634,

to understand the basic knowledge of the technology.¹⁶⁰ With such an understanding, it is hoped that the reader will see why most future paternity actions need never be tried.

A. Scientific Principles

Within the nucleus of all cells in the human body is a molecule called DNA.¹⁶¹ The DNA molecules make up the forty-six chromosomes located in the nucleus of each nucleated cell of the human body, whether that cell is a skin cell, a liver cell, a brain cell, or a white blood cell.¹⁶² The forty-six chromosomes found within each cell of any one person are chemically identical to the other forty-six chromosomes of any other cell within that same person. If the cells are from different persons, there must be some difference in the chemical composition of the chromosomes, unless the two people are identical (monozygotic) twins.¹⁶³

Chromosomes supply the "genetic information" of the body.¹⁶⁴ In other words, it is this difference in the chemical composition of the chromosomes which make people different, with different physical and possibly psychological traits. These different traits are encoded within the chromosomes and are called genes. A gene is simply a segment of the chromosome. There are like genes found in all human beings, but there are also variations of the same

635, 637 (Surr. Ct. 1988) (HLA test showed paternity index to be 56,481 to 1 while DNA test showed paternity index to be 8,077,911 to 1); *People v. Wesley*, 533 N.Y.S.2d 643, 652 (Albany County Ct. 1988), (expert testimony that mean power of identity for identification test is 1.4 billion to 1 for African-Americans and 840 million to 1 for American caucasians).

¹⁶⁰It would be helpful to read the following references and cases for a thorough understanding of the precision and sophistication of DNA profiling: SCHATKIN, *supra* note 13, §§ 11B.01-11B.05; *DNA Analysis for Parentage Evaluation*, Publication No. T149-0391-1, TECHNOLOGY REVIEW, Roche Biomedical Laboratories, Inc. (1991); Peter E. Smouse & Ranajit Chakraborty, *The Use of RFLP in Paternity Analysis*, 38 AM. J. HUM. GENETICS 918 (1985); *People v. Castro*, 545 N.Y.S.2d 985 (Sup. Ct. 1989); *People v. Wesley*, 533 N.Y.S.2d 643 (Sup. Ct. 1988); *Caldwell v. State*, 393 S.E.2d 436 (Ga. 1990); *Andrews v. State*, 533 So. 2d 841 (Fla. Dist. Ct. App. 1988). For a discussion about the precision of DNA probes to determine gene frequency, see Ivan Balazs, Michael Baird, Mindy Clyne & Ellie Meade, *Human Population Genetic Studies of Five Hypervariable DNA Loci*, 44 AM. J. HUM. GENETICS 182 (1989).

¹⁶¹DNA is the abbreviation of the chemical *deoxyribonucleic acid*.

¹⁶²A red blood cell has no nucleus and thus no DNA. See *People v. Wesley*, 533 N.Y.S.2d 643, 644 n.4 (Albany County Ct. 1988).

¹⁶³See *People v. Castro*, 545 N.Y.S.2d 985, 988 (Sup. Ct. 1989).

¹⁶⁴See Eric S. Lander, *DNA Fingerprinting on Trial*, 339 NATURE 501 (1989); *Castro*, 545 N.Y.S.2d at 989.

gene which are called "alleles."¹⁶⁵ It is the detection of these alleles which DNA profiling is all about.

All blood grouping tests, including HLA testing, are merely tests to determine the absence or presence of specific genes, such as the A or B antigen. The procedure is to subject the blood to a chemical test and then to observe which result, of a series of known results, occurs. It is the presence or absence of a particular gene found in the blood that produces this known chemical result which is interpreted to either exclude or include the putative father through the application of the laws of genetics.¹⁶⁶ Because a child receives twenty-three chromosomes from its mother and twenty-three chromosomes from its father—chromosomes which contain an abundant but finite number of genes—a test which could identify a large number of these genes or which could identify the many variations of the same gene would be very precise. This is because a gene—any gene—found in the child and not found in the mother must come from the father.¹⁶⁷ Theoretically, because there is a finite number of genes, if every gene could be detected, either a 100 percent POX or a 100 percent POP result could be achieved.

To understand how the DNA profiling test identifies the different genes, the chemical composition of DNA must be understood. The DNA molecule is often described as a revolving double helix.¹⁶⁸ For a working picture, one must imagine either a spiraling ladder or a twisted zipper.¹⁶⁹ Let us use the ladder model. The sides of the ladder are composed of alternating units of sugar and phosphate, and this composition is the same in every DNA molecule in every human cell in every human being. The rungs of the ladder, however, are composed of different chemical compounds than the sides. Moreover, there are two chemically distinctive rungs. It is these different rungs of the ladder, and in what order they are arranged, which create the specific genetic code, called a genotype, of an individual.¹⁷⁰

¹⁶⁵Castro, 545 N.Y.S.2d at 989. See also Janet C. Hoeffel, Note, *The Dark Side of DNA Profiling: Unreliable Scientific Evidence Meets the Criminal Defendant*, 42 STAN. L. REV. 465, 470 (1990); Lander, *supra* note 164, at 501.

¹⁶⁶See *DNA Analysis for Parentage Evaluation*, *supra* note 160. See also SCHATKIN, *supra* note 13, § 11B.02.

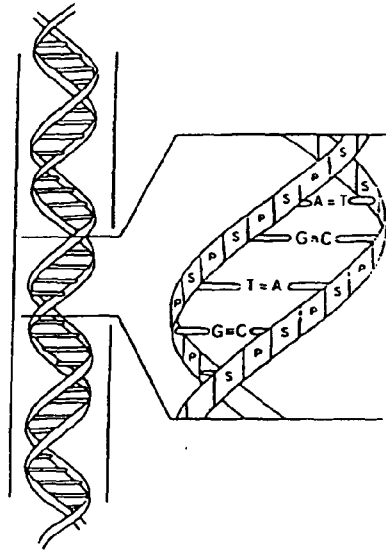
¹⁶⁷See Thompson & Ford, *supra* note 4, at 61-62; Dan L. Burk, *DNA Fingerprinting: Possibilities and Pitfalls of a New Techniques*, 28 JURIMETRICS J. 455, 469-70 (1988).

¹⁶⁸See *Background Information: DNA-Print Identification Test*, LifeCodes Corporation (technical bulletin 1989); Castro, 545 N.Y.S.2d at 988 (Sup. Ct. 1989).

¹⁶⁹See generally EDWARD FRANKEL, *DNA: THE LADDER OF LIFE* (1979).

¹⁷⁰A genotype is the genetic characteristics of an individual while a phenotype is the physical characteristics of the individual. See generally W.F. BODMER & L.L. CAVALLI-SFORZA, *GENETICS, EVOLUTION AND MAN* (1976); CURT STERN, *PRINCIPALS OF HUMAN GENETICS* (1978). When dealing with issues involving heredity, it is common to speak of the haplotypes which is the genetic information inherited from a single parent. See MCCORMICK, *supra* note 8, § 205.

Each rung is composed of two nitrogenous bases. One of these bases is called purine and the other is called pyrimidine. Half of the rung is a purine and the other half is a pyrimidine. There are two types of purines which are called adenine ("A") and guanine ("G"). There are also two types of pyrimidines called thymine ("T") and cytosine ("C"). The purine and pyrimidine units chemically bind to one another in the middle of the rung. A will bind only to T while G will bind only to C.¹⁷¹ Thus, part of the DNA molecule might be represented as in Figure 1 below.



Source: Lifecodes Corporation

Figure 1

It is the configuration of the various A-T, T-A, G-C and C-G combinations—called base sequences—which create the genetic code. For a simplistic example, the combination of the following rungs: A-T, C-G, G-C, T-A, T-A, C-G might be the genetic code for blond hair, while C-G, G-C, T-A, A-T, T-A, C-G might be the code for brown hair.¹⁷² Thus, all that is necessary is to identify the various genes by their chemical combination and then compare these combinations to child, mother and putative father. However, there is no super microscope that reveals these chemical combinations as in Figure 1.

¹⁷¹Lawrence Silverman, *DNA Analysis in the Detection of Genetic Disease*, 4 NEW DEV. SCI. 69, 70 (1989); Victor Weedn, *DNA Profiling*, 1 EXPERT EVID. REP. 61, 62 (1989); C. Lewis, *DNA Fingerprints: Witness for the Prosecution*, DISCOVER 44-47 (Jan. 1988).

¹⁷²In reality, these base pairs run into the thousands, ten thousands, or even hundred thousands. If a single molecule of DNA could be unraveled, it would be approximately six feet in length. *People v. Wesley*, 533 N.Y.S.2d 643, 649 (Albany County Ct. 1988).

Therefore, a more ingenious, and certainly highly complicated, method was developed.

B. Scientific Methodology

Although there are DNA molecules or parts of these molecules which are identical in all human beings, thus forming genes which are universally found in everybody, there are many areas of DNA located between those identified and universal genes whose function is not yet known.¹⁷³ However, these variation of genes—or alleles—are important to forensic science not for what they do in the biochemical operation of the body but for the chemical segments they create and where they are located in the chromosome. These segments are composed of small DNA sequences which are repeated a different number of times in different individuals. As a result of the repetitions, these regions of DNA significantly vary in size throughout the population. These variations in DNA, known as polymorphisms,¹⁷⁴ is what provides the identity profile. An examination of the *polymorphic* loci of the chromosome will reveal different alleles or nucleotide sequences. In other words, the location of the gene in the chromosome and the determination of the chemical combination of the gene is the operative science in DNA profiling.¹⁷⁵

The forensic process of DNA profiling currently entails two distinct methods: the Restriction Fragment Length Polymorphism test ("RFLP") and the Polymerase Chain Reaction or amplification test ("PCR"). Both methods begin with an extraction or isolation stage whereby biological material containing DNA is extracted from the mother, child and putative father. In almost all cases, this is simply a blood draw. Although red blood cells are not nucleated and thus contain no DNA, whole blood also contains white blood cells which can supply all the necessary DNA for analysis. Blood is also a familiar substance and is quite easy to handle. After separating the white blood cells from the red blood cells by centrifugal force, the white cells are purified and the DNA test sample is prepared for the second step, depending on which method is to be used.¹⁷⁶

1. Restriction Fragment Length Polymorphism

The first step of RFLP is called digestion. The purified DNA is exposed to bacterial enzymes known as restriction endonucleases. These enzymes

¹⁷³These areas are also referred to as "anonymous sequences" or simply "junk DNA".
Id.

¹⁷⁴Polymorphism ("many forms") is defined as "the quality or character of occurring in several different forms . . . the occurrence together in the same population of two or more genetically determined phenotypes in such proportions that the rarest of them cannot be maintained merely by recurrent mutation." DORLAND'S ILLUSTRATED MEDICAL DICTIONARY 1332 (27th ed. 1988).

¹⁷⁵See generally Hoeffel, *supra* note 165.

¹⁷⁶Thompson & Ford, *supra* note 4.

molecularly cut the chromosomes at specific locations by recognizing distinct chemical combinations of the nucleotides. The long DNA molecule is thus cut into thousands of small fragments for size analysis.¹⁷⁷

The second step is to separate the fragments and to spread them out. This is accomplished by the process known as electrophoresis.¹⁷⁸ DNA molecules have a net negative electrical charge because of the phosphate. By apply a positive electrical charge, the DNA will be attracted to the electrode emitting that positive charge. The DNA is put into one end of a semi-solid medium—usually Agarose gel—and the positive charge is applied to the other end. The DNA then moves through the medium, with the smaller and lighter fragments moving faster and farther than the larger, heavier fragments. At the end of the process, the DNA is spread throughout the medium in order of decreasing size and molecular weight. Thus, the location of the DNA fragment on the gel is a reliable indication of its size.¹⁷⁹

The next step is to split the double stranded DNA fragments down the middle of the ladder, thereby separating the A-T/C-G base pairs. This is done by introducing chemicals into the gel medium. This process is called denaturing.

The next step is called Southern blotting.¹⁸⁰ The single-stranded DNA fragments are transferred from the electrophoretic gel to a permanent medium. A sturdy nylon paper—or membrane—is placed over the gel and the DNA is lifted by capillary action from the gel to the membrane and becomes trapped in the nylon paper. After exposing the membrane to ultraviolet irradiation or by baking the membrane, the DNA becomes permanently affixed to the membrane.¹⁸¹

The DNA is then ready for the process known as hybridization, whereby DNA probes, manufactured in the laboratory and tagged with a radioactive marker, are introduced to the sample DNA. This probe is a single stranded fragment of DNA containing a specific defined base sequence. For example, the probe might contain the sequence C-T-T-C-A-G. This probe would then seek to hybridize or combine with a single stranded sample DNA fragment with a base sequence of G-A-A-G-T-C. If such a fragment existed in the membrane, hybridization would occur. There are two different types of probes. One is a single locus probe ("SLP") which only seeks out a specific gene in a

¹⁷⁷See generally BENJAMIN LEWIN, *GENES* (3d ed. 1983).

¹⁷⁸See THOMAS MANIATIS, E.F. FRITSCH, J. SAMBROOK, *MOLECULAR CLONING: A LABORATORY MANUAL* (1982).

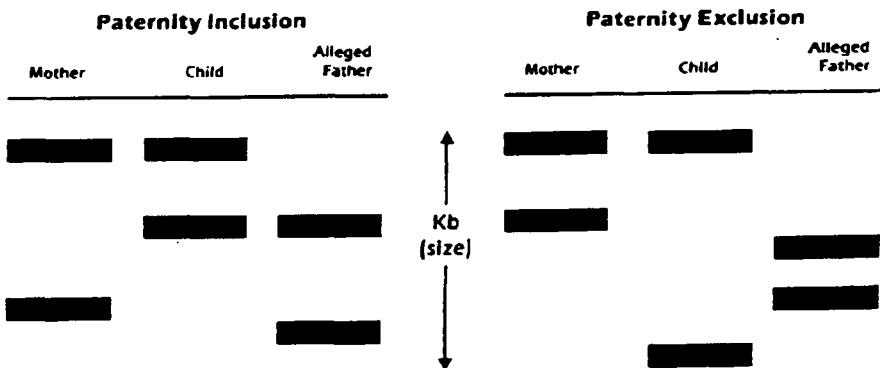
¹⁷⁹See Joseph G. Petrosinelli, Note & Comment, *The Admissibility of DNA Typing: A New Methodology*, 79 *Geo. L.J.* 313, 316 (1990).

¹⁸⁰Southern blotting is named after its inventor, Dr. Edward H. Southern. See Edward H. Southern, *Detection of Specific Sequences Among DNA Fragments Separated by Gel Electrophoresis*, 98 *J. MOLECULAR BIOLOGY* 503 (1975). See also Lawrence K. Altman, *New DNA Test Offers Biological "Fingerprints" for Crime Fight*, *N.Y. TIMES*, Feb. 4, 1986, at A1.

¹⁸¹See Hoeffel, *supra* note 165, at 473; Burk, *supra* note 167, at 460.

known location on the membrane. The other is a multi-loci probe ("MLP") which detects genes from many locations on the membrane simultaneously.¹⁸² Whichever probe is used, the hybridization process takes anywhere from six to forty-eight hours to complete. After that, the membrane is "washed" and any probes which did not hybridize with the sample DNA are removed.¹⁸³

The last laboratory step is called autoradiography. The test membrane now contains sample DNA which has been cut and sorted. If hybridization has occurred, which is very likely, the test sample also contains DNA which has been radioactively tagged. A photographic film is placed over the membrane and the radioactive emissions from the tagged DNA produce an x-ray picture consisting of bands where the radioactive DNA is positioned on the membrane. This picture is called an autoradiogram.¹⁸⁴ The bands resemble the bar codes found on many consumer products.



Source: Lifecodes Corporation

Figure 2

Finally, the autoradiogram is interpreted. Each band designates a specific gene of the individual. Similar location of bands would indicate similar genes. When the three autoradiograms are compared, the child's bands and the mother's bands are matched, leaving only the bands inherited by the child from the biological father and the bands produced by the putative father's DNA. These are called the obligatory bands. If interpretation yields a child's band not

¹⁸²See Alec J. Jeffreys, Victoria Wilson & Swee Lay Thein, *Individual-Specific "Fingerprints" of Human DNA*, 316 NATURE 76, 78 (1985).

¹⁸³See SCHATKIN, *supra* note 13, § 11B.01.

¹⁸⁴An autoradiogram is also called an autoradiograph or simply an autorad. See L. Bonner, *Autoradiograms: 35S and 32P*, 152 METHODS IN ENZYMOLOGY 55 (1987).

found in the putative father's bands, then he is excluded. If not, a POP may be calculated depending on the gene frequency of the specific probe.¹⁸⁵

2. Polymerase Chain Reaction

The other way of detecting fragment length polymorphism is not to fragment the DNA sample but to amplify a specific gene.¹⁸⁶ An enzyme called DNA polymerase is used which causes a specific gene to copy itself. In effect, the laboratory creates millions of copies of a specific gene. The advantages of this method is that it can be performed in less than twenty-four hours, as compared to RFLP which takes approximately two weeks to complete.¹⁸⁷ Moreover, visual interpretation of the results is quicker and simpler.¹⁸⁸

Specifically, the DNA is placed in a heating device called a thermal cyclor which denatures the double-stranded DNA into single strands. The laboratory, knowing which gene it wishes to copy, introduces two short pieces of laboratory-manufactured DNA called primers.¹⁸⁹ These hybridize with the base sequences on either side of the base sequence to be copied. For example, if an overall base sequence is T-A-T-C-G-C-C-G-T on one side and the complementary base sequence on the other side was A-T-A-G-C-G-G-C-A, and the base sequences to be copied are C-G-C and G-C-G, the primers would be A-T-A and G-C-A on one side and T-A-T and C-G-T on the other side. This creates the DNA template, as shown in Figure 3 below.

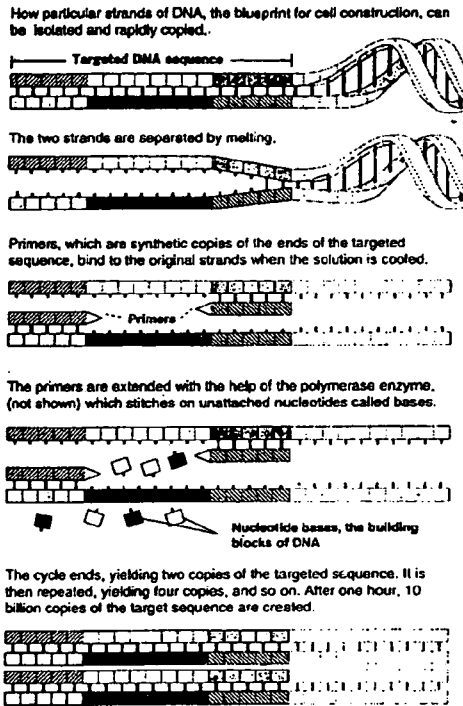
¹⁸⁵Ronald J. Richards, Note, *DNA Fingerprinting and Paternity Testing*, 22 U. CAL. DAVIS L. REV. 609, 621-24 (1989).

¹⁸⁶PCR was developed by Cetus Corporation in 1984 and has since sold this technology to Hoffman-LaRoche Inc. which now markets it as Amplified Fragment Length Polymorphism ("AmpFLP"). See Barnaby J. Feder, *Dispute Arises over Rights for Copying DNA*, N. Y. TIMES, Sept. 17, 1991, at D7. See also Letter, James M. Mason, Ph.D., Director, Dep't of Parentage Evaluation, Roche Biomedical Laboratories (a subsidiary of Hoffman-LaRoche Inc.). This technique is also known as "allele-specific probe analysis" which "relies on technology [that] is newer and perhaps less widely accepted than the other tests." Thompson & Ford, *supra* note 4, at 49-50.

¹⁸⁷*DNA Analysis for Parentage Evaluation*, *supra* note 160.

¹⁸⁸*Id.* See Kary B. Mullis, *The Unusual Origin of the Polymerase Chain Reaction*, SCI. AM., Apr. 1990, at 56. See also Spenser v. Commonwealth, 393 S.E.2d 609 (Va. 1990); Russel Higuchi, Cecilia H. Von Beroldingen, George F. Sensabaugh & Henry A. Erlich, *DNA Typing from Single Hairs*, 332 NATURE 543 (1988).

¹⁸⁹See J. Madeleine Nash, *Ultimate Gene Machine*, TIME, Aug. 12, 1991, at 54-56.



Source: *New York Times and Cetus Corporation*

Figure 3

The polymerase then causes an exact copy of the DNA template to be created. These three steps of denaturing, primer binding and DNA synthesis is called one PCR cycle and the new DNA is called the PCR product.¹⁹⁰

This PCR process is then repeated, and each cycle doubles the amount of specific DNA from the previous cycle, until millions of copies are produced. Then the amplified DNA is put through electrophoresis as with RFLP, but the DNA is chemically stained and not radioactively tagged. The staining technique achieves detection very quickly as opposed to radioactive probes which are time consuming.¹⁹¹

The interpretation of a PCR test result is likewise quicker because the sizing requirement of RFLP is eliminated. The result is a yes-no answer as to whether a specific gene is present. As with any genetic marking test, if the specific gene

¹⁹⁰DNA Analysis for Parentage Evaluation, *supra* note 160.

¹⁹¹Dale Dykes, *The Use of Biotinylated DNA Probes in Parentage Testing: Nonisotopic Labelling and Nontoxic Extraction*, 9 ELECTROPHORESIS 359 (1988); Dale Dykes, P. Fondell, E. Watkins & H.F. Polesky, *The Use of Biotinylated DNA Probes for Detecting Single Copy Human Restriction Fragment Length Polymorphism Separated by Electrophoresis*, 7 ELECTROPHORESIS 278 (1986).

is present in the child but absent in both the mother and the putative father, the putative father is excluded. If the gene is present in the putative father, a gene frequency is calculated to determine the POP. Another PCR test may have to be conducted using a different genetic marker, and if this specific gene is present, a higher POP will be calculated based on the frequency of the two specific genes tested. Obviously, the test may be repeated as many times as necessary to achieve a near 100 percent POP.¹⁹²

C. Evidentiary Admissibility

The evidentiary admissibility of DNA profiling is becoming universal. Whether the evidence is used in a criminal or a civil proceeding, most jurisdictions adhering to the *Frye*¹⁹³ standard have held that DNA profiling has been generally accepted in the relevant scientific community. The minority of jurisdictions which have either never adhered to or have simply abandoned *Frye* impose a basic—and more liberal—relevancy test as exemplified by Rule 401 of the Federal Rules of Evidence.¹⁹⁴ Thus, in almost all jurisdictions and in most cases, DNA profiling has been granted judicial approval.¹⁹⁵

¹⁹²Stephen C. Petrovich, Note, *DNA Typing: A Rush to Judgment*, 24 GA. L. REV. 669, 673-81 (Spring 1990); Thompson & Ford, *supra* note 4, at 76-77.

¹⁹³*Frye v. United States*, 293 F. 1013 (D.C. Cir. 1923). The standard is embodied in the following statement by the court:

Just when a scientific principle or discovery crosses the line between the experimental and 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 status of *Frye* has been significantly modified. See *Daubert v. Merrell Dow Pharmaceuticals, Inc.*, 61 U.S.L.W. 4805 (No. 92-102, June 28, 1993).

¹⁹⁴Fed. R. Evid. 401 states that "relevant evidence is any evidence having any tendency to make the existence of any fact that is of consequence to the determination of the action more probable or less probable than it would be without the evidence." See generally Andre A. Moenssens, *Admissibility of Scientific Evidence: An Alternative to the Frye Rule*, 25 WM. & MARY L. REV. 545 (1984).

¹⁹⁵See, e.g., *United States v. Yee*, 134 F.R.D. 161 (N.D. Ohio 1991); *Tipps v. Metropolitan Life Ins. Co.*, 762 F. Supp. 1270 (S.D. Tex. 1991); *Perry v. State*, 586 So. 2d 242 (Ala. 1991); *People v. Lipscomb*, 574 N.E.2d 1345 (Ill. App. Ct. 1991); *Smith v. Deppish*, 807 P.2d 144 (Kan. 1991); *People v. Adams*, 489 N.W.2d 192 (Mich. App. Ct. 1992); *Mastromatteo v. Harkins*, 615 A.2d 390 (Pa. Super. Ct. 1992); *State v. Wimberly*, 467 N.W.2d 499 (S.D. 1991); *Trimboli v. State*, 817 S.W.2d 785 (Tex. Ct. App. 1991); *Rivera v. State*, 840 P.2d 933 (Wyo. 1992). But see *Commonwealth v. Lanigan*, 596 N.E.2d 311 (Mass. 1992); *State v. Houser*, 409 N.W.2d 168 (Neb. 1992). See generally Clare M. Tande, Note, *DNA Typing: A New Investigative Tool*, 1989 DUKE L.J. 474 (1989); Sally E. Renskers, Comment, *Trial by Certainty: Implications of Genetic "DNA Fingerprints"*, 39 EMORY L.J. 309 (1990); Petrosinelli, *supra* note 179; Petrovich, *supra* note 192; Jane E. Hanner, Note, *DNA Fingerprinting: Evidence of the Future*, 79 KY. L.J. 415 (1991); Jeffrey A. Norman, Comment, *DNA Fingerprinting: Is It Ready for Trial?*, 45 U. MIAMI L. REV. 243 (1990); C. Thomas Blair, Comment, *Spencer v. Commonwealth and Recent Developments in the*

Whether the specific testing procedures used in DNA profiling have met the *Frye* standard so that the evidence obtained is reliable remains in issue.¹⁹⁶ As with any scientific test, the evidence is only as good as the laboratory that conducts the test and the experts that interpret the results. However, it is hardly arguable that a state cannot ensure that a laboratory conducting these kinds of tests comply with generally accepted scientific procedures.¹⁹⁷ Moreover, the laboratory would seem to have a vested interest in only using those procedures which pass the *Frye* standard. Thus, this issue appears to be moot.

One major issue of DNA profiling that must be addressed is the collection and isolation of the test sample before the laboratory assumes custody.¹⁹⁸ Yet within this issue, the criminal case must be distinguished from the paternity action. In the criminal case, the biological material found at a crime scene or obtained under less than ideal circumstances may often be tainted or contaminated. Moreover, in many cases the quantity of biological material available is so minute that it is difficult to collect and isolate, or to do so without damaging the sample.¹⁹⁹ There may be a higher incidence of mislabeling. There

Admissibility of DNA Fingerprint Evidence, 76 VA. L. REV. 853 (1990); Paul C. Giannelli, *Criminal Discovery, Scientific Evidence, and DNA*, 44 VAND. L. REV. 473 (1991).

¹⁹⁶Again, the courts must be careful not to allow the *Berry v. Chaplin* mistake of letting the trier of fact ignore evidence of scientific fact because of the testing procedure. This has been indirectly enunciated with vigor by the decision in *People v. Castro*, 545 N.Y.S.2d 985 (Sup. Ct. 1989).

¹⁹⁷See Gary Spencer, *Panel Urges DNA Test Standard*, N.Y.L.J., Sept. 7, 1989, at A2. Recently, the National Academy of Sciences has stirred the debate by releasing a report entitled "DNA Technology in Forensic Science". Some have construed this report as calling for a moratorium on DNA profiling. See Gina Kolata, *U.S. Panel Seeking Restriction on Use of DNA in Courts*, N.Y. TIMES, Apr. 14, 1992, at A1, C7; Gina Kolata, *Chief Says Panel Backs Courts' Use of a Genetic Test*, N.Y. TIMES, Apr. 15, 1992, at A1, A23; Gina Kolata, *DNA Fingerprinting: Built-In Conflict*, N.Y. TIMES, Apr. 17, 1992, at A13; Gina Kolata, *Some Scientists Doubt the Value of Genetic Fingerprint Evidence*, N.Y. TIMES, Jan. 29, 1990, at A1, A18; Debra Cassens Moss, *DNA: The New Fingerprints*, 74 A.B.A. J. 66 (1988). See also Joe Davidson & Jonathan M. Moses, *Use of DNA Evidence in Court Endorsed*, WALL ST. J., Apr. 15, 1992, at B6; Daniel Wise, *Clamor over DNA Report Provides Grist for Both Sides*, N.Y.L.J., Apr. 17, 1992, at 1, 11. New York Governor Mario Cuomo has proposed the creation of a new "Forensic Science Review Panel" to develop minimum standards for all forensic laboratories in the state. *Governor Proposes DNA Database*, N.Y.L.J., Apr. 21, 1992, at 2; Selwyn Raab, *Cuomo Seeks Genetic Data of Offenders*, N.Y. TIMES, May 10, 1992, at A27, A34.

¹⁹⁸See Laurel Beeler & William R. Wiebe, Comment, *DNA Identification Tests and the Courts*, 63 WASH. L. REV. 903 (1991); Thompson & Ford, *supra* note 4.

¹⁹⁹While it is undisputed that the PCR process—with its ability to "copy" DNA—has reduced the problems associated with processing a miniscule sample, see *supra* notes 182-88, the problems of collecting such a sample still exist. Moreover, even with PCR, the miniscule sample may be contaminated and the wrong DNA could be copied. See Thompson & Ford, *supra* note 4, at 64; Hanner, *supra* note 195, at 422.

is also the possibility of the biological material being mishandled, either by accident or design.²⁰⁰

Of greatest concern is the rigid requirement of due process afforded to the criminal defendant. Since the criminal defendant faces either death or substantial imprisonment, the safeguards granted to such a defendant must be greater than those granted to a putative father at a paternity proceeding. Moreover, the probative value of the DNA evidence, particularly if it is state's strongest or only evidence, might substantially be outweighed by its prejudicial value. In a criminal action, this certainly becomes more of a burden since the state must prove the defendant's guilt beyond a reasonable doubt.

In a civil paternity action, however, the standard of proof is usually by clear and convincing evidence or by a preponderance of the evidence, not evidence beyond a reasonable doubt. If the DNA evidence sustains the burden, the result is not imprisonment but an order of filiation, imposing both rights and responsibilities, burdens and benefits, not only on the putative father but on the mother and child as well. Finally, and perhaps most significantly, the collection stage does not present the uncertainties of biological evidence found at a crime scene.²⁰¹ In almost all cases, the simple blood draw, performed by qualified personnel and under proper procedures, eliminates any questions of collection aberrations.²⁰² Even in those cases where the putative father is not available for testing, either because of death or disappearance, any biological remains of that person, properly certified, may be used for testing purposes.²⁰³

²⁰⁰This, of course, is one of the great fears involving DNA evidence: that someone might be convicted of a crime because a biological sample was coincidentally left, or maliciously placed, at the crime scene. The other great fear is that the collection of DNA evidence will violate the constitutional right to privacy. This Article does not address the extremely important issue of DNA data banking. For a thorough discussion see E. Donald Shapiro, *Dangers of DNA: It Ain't Just Fingerprints*, N.Y.L.J., Jan. 23, 1990, at 1; E. Donald Shapiro & Michelle Weinberg, *DNA Data Banking: The Dangerous Erosion of Privacy*, 38 CLEV. ST. L. REV. 455 (1991); Myk Cherskov, *Fighting Genetic Discrimination*, 78 A.B.A. J. 38 (1992).

²⁰¹See Rorie Sherman, *DNA Tests Unravel?*, NAT. L. J., Dec. 18, 1989, at 24; Burk, *supra* note 167, at 456; Anthony Pearsall, *DNA Printing: The Unexamined "Witness" in Criminal Trials*, 77 CAL. L. REV. 665, 670-73 (1989).

²⁰²See *J.E.B. v. State ex. rel T.B.*, 606 So. 2d 156 (Ala. Civ. App. 1992) (forensic DNA testing distinguished from clinical DNA testing); *S.L.B. v. K.A.*, 579 N.Y.S.2d 964, 966-68 (Fam. Ct. 1992) (*People v. Castro* distinguished based on differences in civil and criminal DNA sample collection method). As an added testing control measure, the mother, child and putative father might be assembled together and have the blood drawn in each other's presence. Of course, as adverse parties involved in an emotionally charged issue, this added measure of immediate propinquity may create more problems than it solves.

²⁰³See, e.g., *Batcheldor v. Boyd*, 423 S.E.2d 810 (N.C. Ct. App. 1992) (Court permitted examination of corpse for DNA paternity test); *Alexander v. Alexander*, 537 N.E.2d 1310 (Ohio P. Ct. 1988) (court allows deceased putative father to be exhumed for purposes of DNA paternity test). But see, *Estate of Sidney Janus*, N.Y.L.J., May 25, 1993, at 24 (court denies exhumation of deceased putative father for purposes of paternity test because, *inter alia*, "[t]here may not be sufficient DNA material . . ."). For a discussion of whether or not an action will be against a deceased putative father, see W.E. Shipley,

In all, the differences between the use of DNA profiling in a paternity proceeding and in a criminal trial are so great that a comparison between the two is unreasonable. But of greatest significance is that in a criminal case the DNA evidence merely goes to the proof of identification and to the fact of the defendant's presence at the crime scene. It does not go to the proof of the criminal act itself. In a paternity proceeding, however, the DNA evidence—directly and ultimately—goes to the very issue being tried. Even in a rape trial, DNA evidence proving the act of sexual intercourse by the defendant does not prove the issue of rape because the question of consent remains open.²⁰⁴ It is only in the paternity action that DNA evidence, having proved the identity of the father, leaves no other issue of the action to be decided.

V. THE FUTURE OF THE PATERNITY ACTION

As this Article has shown, the paternity action has evolved from a criminal action into a civil one. The punishments and penalties of fatherhood now includes both rights and responsibilities. Accordingly, the standards and burdens of proof under this action have likewise changed.

The "mechanics" of the proceeding have also changed. Once, the proceeding had to contend with very little competent evidence consisting mostly of uncorroborated testimony and/or pseudo-scientific *bald eagle* evidence. Now, the action has transcended to a process which can completely determine paternity by a precise scientific testing method. DNA profiling has given to the judicial system not only the means to settle a legal issue with speed and efficacy, but also through a process that decides the issue fully and fairly.

While the majority of today's paternity actions are not disputed, those that do go to trial only burden the judicial process and take advantage of the law. The fact remains that the law has not kept current, and these trials to determine paternity are for the most part unnecessary. Tomorrow's paternity actions should not be burdened by the ambiguity of statutes or the overloading of the judicial machinery. Tomorrow's paternity actions should—and can—be swiftly decided without a trier of fact. The use of DNA profiling in this process—properly performed—can only be of benefit to all parties.

Moreover, in our highly mobile, computerized electro-magnetic world, it certainly would be beneficial if society knew exactly who had produced whom. Succession rights, citizenship rights and medical necessities are just some of the reasons, other than support or tax obligations, that a state would want its citizenry properly defined by their biological relations. Of course, although these relationships may not be biologically broken, they may always be legally altered through custody, guardianship or adoption proceedings after any

Annotation, *Death of Putative Father as Precluding Action for Determination of Paternity or for Child Support*, 58 A.L.R.3d 188 (1992).

²⁰⁴Of course, DNA evidence would conclusively prove statutory rape since it is a strict liability crime where the issue of consent is immaterial. However, whether a court would apply a reasonable doubt standard to the DNA profiling test to prove the element of the crime or some lower proof standard might vary from jurisdiction to jurisdiction.

biological determinations have been adjudicated. If society is to thrive and succeed in this information age, it is necessary that the information—including first and foremost its biological information—be correct.

Furthermore, it should be recognized that under the doctrine of *parens patriae* a state has the right to know who has fathered its children. Accordingly, a state has standing to bring a paternity action in the interests of the people. Others who have standing must include the mother. A biological father denied visitation because he is not the father of record would also appear to have standing. Moreover, the father of record who, for whatever reason, wants to prove that he is not the biological father is another who most likely has standing. Finally, there will be situations where other individuals, notably grandparents, may want to claim standing to determine paternity and establish their rights.

Finally, there is the question as to whether the child should have the right to discover the identity of its true father, and if so, then what restrictions may a state impose which would be constitutionally permissible. This Article is not designed to address this specific question, but leaves such a debate open. However, we take note of the growing movement by children's rights groups who advocate that out-of-wedlock children be permitted this right.

This thus leaves us on the doorstep of tomorrow with a precise method to determine paternity but a hodgepodge of statutes across the nation which are antiquated, ambiguous or simply not comprehensive. This only summons litigation concerning the issues of litigation, not the subject of the litigation itself. It is our belief that the paternity action must be driven by genetic marking tests under the watchful eye of the courts. These tests may either exclude or include the putative father as the biological father, and should both be given conclusive weight if certain requirements are met. It is only up to the state legislatures to ensure that a modern paternity statute, which provides for expedient determination of paternity and yet grants full substantive and procedural due process rights passing constitutional muster under intermediate judicial scrutiny is enacted immediately so that a needless waste of resources is avoided. Below we offer model legislation which if enacted in all jurisdictions, even with some variations, would create a uniformity that can only better society.

VI. THE UNIFORM PATERNITY DETERMINATION ACT

1. NAME: This Act shall be known as the Uniform Paternity Determination Act and should be cited by that name or by its abbreviation of UPDA.

2. PURPOSE: The purpose of this act is to establish the method and procedure by which a court of competent subject matter jurisdiction shall determine paternity when paternity is at issue.

3. CIVIL ACTION: A paternity action under this act is a civil action and not a criminal action.

4. COURT OF COMPETENT SUBJECT MATTER JURISDICTION: All paternity actions commenced in this state shall be heard in the [name of the court of competent subject matter jurisdiction] which has exclusive original jurisdiction.

5. TRIER OF FACT: The trier of fact under this act shall be a judge of the [court of competent subject matter jurisdiction]. No trial under this act shall be before a jury.

6. **PARTIES:** The parties to this action shall be known as petitioner and respondent.

7. **COMMENCEMENT OF ACTION:** The action is commenced by the filing of a petition in the [court of competent subject matter jurisdiction] by a party who has standing.

8. **STANDING:** The following have standing to file a petition:

- (1) The specific child,
- (2) The biological mother,
- (3) The legal custodian or legal guardian of the child,
- (4) The father of record,
- (5) The putative biological father,
- (6) The grandparents of record,
- (7) The putative biological grandparents,
- (8) Any authorized federal, state or local governmental agency, department, division, commission, organization or group, and
- (9) Any individual or organization which, in the court's discretion, has shown good cause to have standing approved by the court.

9. **RESPONDENTS:** The respondent may be any party who has standing as a petitioner.

10. **JURISDICTIONAL CONFLICTS:** A petition may be filed in the court of competent subject matter jurisdiction in any state where any party [resides] [has resided for at least [x] duration]. The filing of a petition by any party who has standing naming a specific individual as the putative father of a specific child precludes the filing of any other petition by any other party in any other jurisdiction naming that specific individual as the putative father of that specific child. A court of competent subject matter jurisdiction where a valid petition has been filed has the discretion to transfer the action to another court of competent jurisdiction in another state in the interests of fairness, justice and reason.

11. **STATUTE OF LIMITATIONS:** This action must be commenced by any party except the child or any authorized governmental body within [x] years from the child's birth. The action must be commenced by the child within [x] years from the time the child reaches majority. The action may be commenced by any authorized governmental body at any time.

12. **NO PRESUMPTION OF LEGITIMACY:** There is no presumption that a child born to a legally married couple is an issue of that marriage.

12. [Alternate] **PRESUMPTION OF LEGITIMACY:** The court shall presume that a child born to a legally married couple is an issue of that marriage. The presumption may be rebutted, if the action is brought within [x] years from the birth of the child, by clear and convincing evidence that the father of record was incapable of fathering the child.

13. **BURDENS OF PROOF:** The petitioner must prove by [clear and convincing] [a preponderance of the] evidence that the putative father is the biological father.

14. **PETITION:** The petition must (1) name the putative biological father and the biological mother of the specific child in question, (2) request the court to determine the validity of the assertion of paternity and to adjudicate paternity and (3) request the court to order a certified paternity test of the child,

the biological mother, the putative father and any other party or individual relevant to the action. A petition must only name one specific child in question; a petition which names more than one specific child in question shall be dismissed by the court without prejudice.

15. **SERVICE OF PETITION:** The petition, along with a notice to appear, must be personally served upon the respondent. It may be served within or without the state where the petition is filed. It must be served by a person who is eighteen years or older and who is not a party to the action. The person who personally serves the petition and notice must file an affidavit of personal service with the court. If the respondent cannot be found after a diligent search, or if the respondent refuses service, by evasion or by similar conduct, then the court may order service by any other means reasonably calculated to give the respondent notice of the action.

16. **ANSWER:** The answer must (1) be served on the petitioner or filed with the court within 20 days after the service of the petition and notice, (2) admit or deny that the putative father named in the petition is the biological father and (3) name the true biological father of the specific child if known to the respondent if the respondent denies that the putative father named in the petition is the biological father.

17. **VERIFICATION:** Both the petition and the answer shall be verified by oath or affirmation under penalty of perjury.

18. **DEFAULT:** Default by the respondent shall result in the granting of the petition. At the sole discretion of the court, a respondent with an excusable default may file an answer at any time and the court may vacate the default judgment.

19. **CERTIFIED PATERNITY TESTS:** The court shall order the child, the biological mother, the putative father and all other parties relevant to the determination of paternity to submit to a certified paternity test ("CPT"). A party may not refuse to submit to a CPT based on religious or medical reasons. The refusal by any party to submit to a CPT shall be considered by the court as an act of civil contempt. If any party refuses to submit to a CPT, the court may decide the issue of paternity against the party who is refusing to submit to the CPT.

20. **CERTIFIED PATERNITY TESTING LABORATORY:** The CPT shall be administered by a certified paternity testing laboratory ("CPTL"). The [authorized public official] of the [authorized department] shall certify at least two laboratories for paternity testing and prescribe regulations regarding the collection of the test samples, the chain of custody of the test samples, the testing methods used by the CPTL, the quality control of the testing procedures, and the analysis of the test results.

21. **CERTIFIED PATERNITY TEST SAMPLES:** All parties to the action must submit to a CPT as ordered by the court and allow the collection of certified paternity test samples. Test samples may be blood samples, skin samples, hair samples, tissue samples or may be any biological material that can be certified as belonging to and being of the specific party to be tested. If a party is not available for testing, due to death, disappearance or otherwise, then the court may order the collection of a certified biological sample of that party from any available source to be used as a test sample. A fetus or newborn must provide test samples unless two physicians submit affidavits declaring that the

collection of such test samples is medically dangerous to the mother, or to the fetus or newborn.

22. CPTL PROCEDURE: The certified paternity test samples shall be subjected to genetic marking tests which are generally accepted by the scientific community. This includes, but is not limited to, blood grouping tests, human leukocyte antigen ("HLA") tests and deoxyribonucleic acid ("DNA") profiling tests. The number of tests and the type of tests shall be prescribed by regulation or shall be conducted at the discretion of the CPTL.

23. CPT METHOD: The CPT shall attempt to exclude the putative father under the principles of heredity by genetic marking tests which are generally accepted by the scientific community. If the CPT results do not exclude the putative father, then the CPTL shall calculate a Probability of Paternity ("POP") under generally accepted scientific and statistical methods based upon population gene frequency which is to be expressed as both a Paternity Index ("PI") and as a percentage.

24. EXCLUSION: If the CPT excludes the putative father as a possible biological father, then the court shall dismiss the petition with prejudice.

25. INCLUSION: POP BELOW [99] PERCENT: If the POP is below [99] percent, then the court shall conclusively presume that the putative father is not the biological father and the petition shall be dismissed with prejudice.

26. INCLUSION: POP BETWEEN [99-99.99] PERCENT: If the POP is at least [99] percent but below [99.99] percent, then the court shall try the issue of paternity and admit all relevant evidence.

27. INCLUSION: POP BETWEEN [99.99-99.9999] PERCENT: If the POP is at least [99.99] percent but below [99.9999] percent, then the court shall presume that the putative father is the biological father. This presumption may be rebutted by the respondent only by clear and convincing evidence that the putative father was totally incapable of fathering the child, or that the putative father has an identical twin [*or that the mother has engaged in multiple sexual relations during the time of conception*].

28. INCLUSION: POP ABOVE [99.9999] PERCENT: If the POP is at least [99.9999] percent or above, then the court shall conclusively presume that the putative father is the biological father unless the respondent has declared in his answer the fact that the putative father has an identical twin, and if so then the court shall try the issue of paternity and admit all relevant evidence.

29. REBUTTAL: A respondent may rebut a presumption of paternity but only by submitting a motion to rebut which must be supported by affidavits showing evidence that the putative father could not be the biological father of the child. The court, in its sole discretion based upon the strength of the rebuttal evidence, shall then try the issue of paternity and admit all relevant evidence.

30. ADDITIONAL CPT REQUESTS: Any party may request, and the court shall order if requested, a second CPT regardless of the test results. Any party may request, and the court, in its sole discretion, may order, a third or subsequent CPT.

31. COSTS OF CPT: The cost of the first CPT shall be paid by the petitioner if the putative father is determined not to be the biological father or by the respondent if the putative father is determined to be the biological father. Subsequent CPTs shall be paid by the party requesting the CPT if the subsequent CPT validates the first CPT. If the subsequent CPT invalidates the

first CPT, then the petitioner shall pay the cost of all CPTs if the putative father is determined not to be the biological father or by the respondent if the putative father is determined to be the biological father. The state shall pay the cost of the CPTs if the party who must pay is indigent.

32. **OTHER COSTS:** In addition to the cost of the CPT, the court may order either party to pay all or part of any other reasonable costs, including attorneys' fees.

33. **ARTIFICIAL INSEMINATION/ IMPLANTATION:** A man who donates his sperm or a woman who donates her ovum for the purposes of reproduction but who does not have, at the time of donation, the intent to be a parent (putative or otherwise) shall have no right to bring this action and shall have no liability under this act.

34. **SEX REASSIGNMENT:** The fact that the putative father has undergone a sex reassignment is not a bar or a defense in this action.

35. **SURROGACY:** A woman who does not provide her own chromosomes but who carries and gives birth to a child is not the biological mother of that child under this act.

36. **ALTERNATIVE PROCREATION:** If the specific child is a result of alternative or recombinant procreation methods achieved through genetic engineering conducted in a laboratory or in a similar environment, or by any other means or by any other method, then the court is free, in its sole and unbridled discretion, to determine both maternity and paternity by any method and procedure whatsoever.

37. **INTERNATIONAL APPLICATION:** This act shall have international application either by treaty or under the doctrine of comity. All determinations of paternity under this act shall be recognized by all international forums and jurisdictions.

38. **SEPARABILITY AND SEVERABILITY:** Any provision of this act found to be unconstitutional or invalid by a court of competent jurisdiction may be separated and severed from this act, and such finding shall not affect or impair the constitutionality or validity of the remainder of this act or the application thereof to other persons and circumstances.

VII. CONCLUSION

From ancient times, the issues of paternity have always existed, creating both legal and social tensions. Yet there was no paternity action until the English Parliament created it in 1576. Since then, the paternity action has transformed from a criminal action into a civil action. Accordingly, the standards and burdens of proof, as have the trial techniques, have changed. It is unquestionable that the state has a compelling interest in knowing who the father of any given child is, particularly those children who have become public charges. Moreover, the mother undoubtedly has a right to know, as does the biological father and the father of record. And the argument can be made that the out-of-wedlock child also has a right to know. Thus, when the issue of paternity arises, it should be settled and settled expeditiously.

Society now has the tools to determine paternity swiftly and accurately. With the advent of DNA profiling, as well as other genetic marking tests, a proper laboratory can not only determine paternity by excluding a falsely accused man, but it can compute the probability that the genetic material found in the

child came from that non-excluded accused man. With HLA and DNA testing, the probability is so close to 100 percent that the paternity trial as we know it today should be abolished. States should enact legislation whereby these genetic tests are given conclusive weight of the presumption of paternity, subject to the court's discretion in rare and extreme instances.

The model legislation appropriately called the Uniform Paternity Determination Act offered in this Article resolves the troublesome issues of jurisdiction, standing, presumptions and conclusions. If enacted in all fifty jurisdictions it will save millions of dollars that would otherwise be spent challenging these issues and those related simply to statutory construction. With the number of illegitimate births increasing every year, coupled with the ever increasing precision of DNA profiling, it is imperative that the UPDA or a similar version be implemented at once.

