

**S B**

**275**

# FISCAL NOTE

**REQUEST:**

Revision Date:	Agency Affected:	<u>Alaska Court System</u>
Title: <u>An Act concerning the admissibility</u>	BRU:	<u>Trial Courts</u>
Sponsor: <u>Jones, Rodey, Falks, Fischer, ...</u>	Components:	
Requestor: <u>Judiciary</u>		

**EXPENDITURES/REVENUES: (Thousands of Dollars)**

OPERATING	FY 89	FY 90	FY 91	FY 92	FY 93	FY 94
Personal Services						
Travel						
Contractual						
Supplies						
Equipment						
Land & Structures						
Grants & Claims						
<b>TOTAL OPERATING</b>	<b>0.0</b>	<b>0.0</b>	<b>0.0</b>	<b>0.0</b>	<b>0.0</b>	<b>0.0</b>
<b>CAPITAL</b>						
<b>REVENUE</b>						

**FUNDING: (Thousands of Dollars)**

General Funds	0.0	0.0	0.0	0.0	0.0	0.0
Federal Funds						
Other						
<b>TOTAL</b>	<b>0.0</b>	<b>0.0</b>	<b>0.0</b>	<b>0.0</b>	<b>0.0</b>	<b>0.0</b>

**POSITIONS:**

Full-time						
Part-time						
Temporary						

**ANALYSIS: (Attach a separate page if necessary)**

No fiscal impact.

Prepared by: Jan Strandberg, General Counsel  
 Division: Alaska Court System

Approved by: Arthur H. Snowden, II, Administrative Director  
 Agency: Alaska Court System

Phone: 284-8228  
 Date: 04/17/89

Date: 04/17/89

Distribution (by preparor):  
 Legislative Finance  
 Legislative Sponsor  
 Requestor  
 Office of Management & Budget  
 Impacted Agency(ies)

## FISCAL NOTE

**REQUEST:**

Revision Date: \_\_\_\_\_  
 Title: "An Act... admissibility into evi-  
 dence of dioxynucleic acid (DNA)..."  
 Sponsor: Senator Jones  
 Requestor: Senate Judiciary

Agency Affected: Department of Law  
 BRU: Prosecutor  
 Components: All

**EXPENDITURES/REVENUES:** (Thousands of Dollars)

OPERATING	FY 89	FY 90	FY 91	FY 92	FY 93	FY 94
PERSONAL SERVICES						
TRAVEL						
CONTRACTUAL						
SUPPLIES						
EQUIPMENT						
LAND & STRUCTURES						
GRANTS, CLAIMS						
MISCELLANEOUS						
<b>TOTAL OPERATING</b>	<b>-0-</b>	<b>-0-</b>	<b>-0-</b>	<b>-0-</b>	<b>-0-</b>	<b>-0-</b>

CAPITAL						
---------	--	--	--	--	--	--

REVENUE						
---------	--	--	--	--	--	--

**FUNDING:** (Thousands of Dollars)

GENERAL FUND	-0-	-0-	-0-	-0-	-0-	-0-
FEDERAL FUNDS						
OTHER						
<b>TOTAL</b>						

**POSITIONS:**

FULL-TIME	-0-	-0-	-0-	-0-	-0-	-0-
PART-TIME						
TEMPORARY						

**ANALYSIS :** (Attach a separate page if necessary)

Please see the attached analysis.

*Richard L. Pegues*

Prepared by: Richard L. Pegues, Director Phone: 465-3672  
 Division: Administrative Services Date: April 16, 1989

Approved by Commissioner: Douglas B. Bailey, Attorney General Date: April 16, 1989  
 Agency: Department of Law

**Distribution (by preparer):**

- Legislative Finance
- Legislative Sponsor
- Requestor
- Office of Management and Budget
- Impacted Agency(ies)

## CONTINUATION of FISCAL NOTE ANALYSIS

For Bill/Resolution No. SD 275

This bill amends AS 09.25, AS 12.45, and has the effect of amending Rules 401 and 403 of the Alaska Rules of Evidence, to provide that the results of a deoxiribonucleic acid (DNA) print test is admissible evidence in a civil or criminal action or proceeding. The bill further provides that there is a presumption that a DNA print test is valid, and further foundation for introduction as evidence is unnecessary if the DNA print test was performed by a person who has been fully trained to perform the test and the person's training has been certified or monitored by the Department of Public Safety. Lastly, the bill has the effect of amending Rules 703 and 705 of the Alaska Rules of Evidence by eliminating a requirement that the court require or allow antecedent expert testimony concerning the reliability of a DNA print test as a method of identification prior to its receipt into evidence under certain conditions.

This is a procedural change which acknowledges the scientific reliability of the DNA print test identification method. Because it deals with evidence procedures, the bill will not have a fiscal impact on the Department of Law.

**Senate Bill 275**  
**Admissibility of DNA Print Test Evidence**

**A Discussion Paper**

**by**

**Office of Senator Lloyd Jones**

Researched by Senate Advisory Council and Legislative Legal Services

## HOW OTHER STATES USE DNA PRINT TESTS

### California

California is setting up a data bank system in which everyone convicted of sex offenses, felony assaults, and homicides will be profiled. The program will be phased into existence. The first phase is setting up a laboratory in Berkeley with 21 people at a cost of \$1.8 to \$1.9 million annually. The second phase is to create the computerized data bank at a cost of \$625-630,000. The third phase is to provide training in standardized techniques to sub-regional laboratories operated by cities and counties which will cost \$2.1 million.

### Washington

Washington is setting up a laboratory and a DNA data base of convicted criminals. Washington has a three phase program to establish DNA profiling. The Washington state budget for the biennium is \$900,000 of which \$285,000 is start up equipment money. The staff will include 2 forensic scientists, 2 technicians, 1 molecular chemist, and 1 clerk typist. The personnel budget for the biennium is \$500,000 and the remainder of \$115,000 is for supplies. A population study was to be completed by November 1988; collection of blood samples from convicted sex and violent prisoners by December 1, 1989; and a DNA laboratory should be open by June 1990.

### Florida

Florida is setting up five laboratories to do DNA fingerprinting on criminal and paternity cases. The state already has 20 people doing conventional serology work and are anticipating a large caseload. Current legislation is pending which includes a fiscal note of \$150,000 to develop a DNA bank. That State of Florida will spend, overall, \$1 million for DNA print tests. Training will be a large part of the budget for the first few years. To date 13 cases have been taken to court in Florida on the basis of DNA profiling.

### New York

New York is staffing a laboratory with four people and \$50,000 of additional equipment to conduct DNA profiling. Officials there anticipate it will be one year before staff training will be complete and the program will be operational.

### Federal Bureau of Investigation

The FBI is currently doing DNA profiling for states and other jurisdictions. However, it is on a first come first serve basis and only for homicides which are recent cases and in which there is a suspect. It takes about eight weeks for a sample to be analyzed.

## POLICY ISSUES

The matter of infringement of civil liberties and constitutional rights seems to be the major policy concern regarding DNA data banking. This issue comes up when states enact a requirement that all persons convicted of sex, homicide and violent crimes submit materials for profiling. Lawmakers have worked closely with civil liberties advocates in developing legislation. Many believe DNA profiling is just an extension of serological tests which are standard and acceptable.

There is no provision for data banking in my proposed legislation. The issue of violation of civil liberties will be, I suspect, less of a controversy.

Without provisions for a DNA testing lab, my bill should not carry a fiscal note. The cost of lab work for DNA print testing would be incurred on a case-by-case basis. As in the regular standard operating procedure, cost of forensic testing would be borne by the state.

## PURPOSE OF THE LEGISLATION

The "need" for this legislation arises out of existing case law decisions governing acceptance or rejection of evidence based on changing scientific technologies. With the enactment of this legislation, prosecutors would not be faced with extended court appeals if they chose to use DNA print tests as evidence. The legislation assumes DNA genetic print test results have attained sufficient general acceptance in the scientific community as to warrant its acceptance.

### Background

Admissibility of the evidence is the threshold legal question when considering DNA print tests. Historically, Frye v. U.S., 293 F. 1013 (D.C. Circ. 1923) has governed admission of the product of new scientific techniques into evidence in Alaska courts.

Frye involved the question of admissibility of lie detector test results. In the decision, the federal court held that expert testimony relating to novel scientific evidence must satisfy a special foundational requirement not applicable to other types of expert testimony, and that the technique must be sufficiently established to have gained general acceptance in the relevant scientific community.

In Alaska, the initial case was Pulakis v. State, 476 P.2d 478 (Alaska 1970) in which the court determined the results of polygraph reports should not be received in evidence over objection to their admission. Considering the question, the state Supreme Court cited and relied on Frye:

## POLICY ISSUES

The matter of infringement of civil liberties and constitutional rights seems to be the major policy concern regarding DNA data banking. This issue comes up when states enact a requirement that all persons convicted of sex, homicide and violent crimes submit materials for profiling. Lawmakers have worked closely with civil liberties advocates in developing legislation. Many believe DNA profiling is just an extension of serological tests which are standard and acceptable.

There is no provision for data banking in my proposed legislation. The issue of violation of civil liberties will be, I suspect, less of a controversy.

Without provisions for a DNA testing lab, my bill should not carry a fiscal note. The cost of lab work for DNA print testing would be incurred on a case-by-case basis. As in the regular standard operating procedure, cost of forensic testing would be borne by the state.

## PURPOSE OF THE LEGISLATION

The "need" for this legislation arises out of existing case law decisions governing acceptance or rejection of evidence based on changing scientific technologies. With the enactment of this legislation, prosecutors would not be faced with extended court appeals if they chose to use DNA print tests as evidence. The legislation assumes DNA genetic print test results have attained sufficient general acceptance in the scientific community as to warrant its acceptance.

### Background

Admissibility of the evidence is the threshold legal question when considering DNA print tests. Historically, Frve v. U.S., 293 F. 1013 (D.C. Circ. 1923) has governed admission of the product of new scientific techniques into evidence in Alaska courts.

Frve involved the question of admissibility of lie detector test results. In the decision, the federal court held that expert testimony relating to novel scientific evidence must satisfy a special foundational requirement not applicable to other types of expert testimony, and that the technique must be sufficiently established to have gained general acceptance in the relevant scientific community.

In Alaska, the initial case was Pulakis v. State, 476 P.2d 478 (Alaska 1970) in which the court determined the results of polygraph reports should not be received in evidence over objection to their admission. Considering the question, the state Supreme Court cited and relied on Frve:

(T) he general rule precludes admission of the results of the polygraph tests. The authority usually cited as the first reported American case holding such evidence inadmissible is Frye v. United States. In Frye, the court said of expert testimony based on a test of blood pressure fluctuations...:

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 the 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.

Frye v. United States, supra, at 1014, quoted in Pulakis, supra, at 478.

Reliance on the Frye approach adopted by the Supreme Court in Pulakis was discussed in Contreras v. State, 718 P.2d 129 (Alaska, 1986) (extending the Frye test to consider hypnotically-induced testimony by a witness)<sup>1</sup> and Rodriguez v. State, 741 P. 2d 1200 (AK. App., 1987) (applying the Frye test to admit testimony by an expert witness providing background information to assist a jury).

In the only reported appellate decision considering and upholding the admissibility of DNA print identification evidence, Andrews v. Florida, 533 So.2d 841 (Fla.Ct.App. 1988), reh. den., the Florida Court of Appeals (comparable to the Alaska Court of Appeals—it is not that state's highest court) allowed consideration of DNA print identification evidence at a criminal trial. The Florida court applied the so-called "relevancy approach" that had been substantially adopted in U.S. v. Downing, 753 F.2d 1224 (3d Circ. 1985), a test that required the court to assess:

- the novelty of the technique;
- the existence of a specialized literature dealing with the technique
- the qualifications and stature of expert witnesses (who, in this case, were required to explain the operation of the test and its results to the jury); and
- the nonjudicial uses to which the scientific technique is applied.

---

<sup>1</sup>In Contreras, the Supreme Court declared:

The Frye standard is essentially a "prejudice-versus-probative value test," similar to (Alaska) Evidence Rule 403. Since there is a significant danger of prejudice from admitting evidence which appears scientific and is especially likely to be believed, and which has no probative value if it is unreliable, such evidence should be excluded. Application of the Frye test permits the court, rather than the jury, to make a threshold reliability determination.

Finding genetic print analysis a reliable, well established procedure that has been regularly and successfully used in forensic, paternity, and clinical testing, the Florida court upheld the use of the test in that state's criminal proceedings and admitted the evidence obtained from it.

Since the courts have not built an extensive record, it is felt Alaska courts would continue to use the Frye test in regards to admissibility of DNA print test evidence. My proposed legislation adds to the body of law governing criminal procedures authority to admit DNA genetic print test evidence. It follows the model used for admission of evidence of chemical analysis of breath and blood for purposes of operating a motor vehicle, aircraft, or watercraft while intoxicated (AS 28.35.033(d)), AS 09.25.300(a) establishes the presumption of admissibility of test results contingent on the test's performance by a qualified individual, and prescribes how an individual may be deemed qualified. This legislation would, replace the court's case-by-case determination for the legislature's determination.

I plan to request extensive hearings in the Senate Judiciary Committee and, by the Committee's findings, enter into record that DNA print tests have, indeed, attained sufficient reliability and general acceptance in the scientific community as to be admissible in criminal and civil proceedings.

The state prosecutor's office has reviewed this legislation and intends to support it.

STATE OF ALASKA  
THE LEGISLATURE

POUCH Y STATE CAPITOL  
JUNEAU ALASKA 99811  
907 465 1800


LEGISLATIVE AFFAIRS AGENCY

MEMORANDUM

April 8, 1989

SUBJECT: Admissibility of DNA print test evidence  
(Work order 6-1032E) -- sectional analysis

TO: Senator Lloyd Jones

FROM: Jack Chenoweth  
Legislative Counsel 

The bill as prepared and offered for legislative consideration provides for the admission in civil and criminal proceedings in the courts of the state evidence that is based on the DNA fingerprinting or genetic identification process.

Bill section 1 adds to the body of law governing criminal procedures authority to admit DNA genetic print test evidence. Following the model used for admission of evidence of chemical analysis of breath and blood for purposes of operating a motor vehicle, aircraft, or watercraft while intoxicated (AS 28.35.033(d)), AS 09.25.300(a) establishes the presumption of admissibility of test results contingent on the test's performance by a qualified individual, and prescribes how an individual may be deemed qualified. Since genetic print test evidence deals in probabilities--in the likelihood that two or more individuals would not have identical genes and therefore would not have identical genetic print test results--AS 09.25.300(b) authorizes admission in a civil proceeding any statistical population frequency computations based upon the DNA genetic print tests. Definitions of two terms used in the section are offered in AS 09.25.300(c).

AS 12.45.035, added to the Criminal Procedure Code by bill section 2, makes the provisions of AS 09.25.300 applicable in criminal prosecutions.

Normally, court rules apply to determine the admissibility of evidence. In this case, the proposed legislation should cut off extended court consideration as to whether or not

Senator Lloyd Jones  
Page 2  
April 8, 1989

DNA genetic print test results have attained sufficient reliability and general acceptance in the scientific community as to be admissible. As to DNA genetic print testing, the legislation substitutes the legislature's determination for case-by-case determinations under applicable provisions of the Alaska Code of Evidence. Necessarily, the legislation affects court rules, and bill sections 3 and 4 are included to identify the court rules that we believe are affected.

The legislation is given an immediate effective date by bill section 5.

JC:lmb  
L7/054

court shall instruct the jury accordingly. When the burden of producing evidence to meet a presumption is satisfied, the court must instruct the jury that it may, but is not required to, infer the existence of the presumed fact from the proved fact, but no mention of the word "presumption" may be made to the jury.

(b) **Prima Facie Evidence.** A statute providing that a fact or group of facts is prima facie evidence of another fact establishes a presumption within the meaning of this rule.

(c) **Inconsistent Presumption.** If two presumptions arise which conflict with each other, the court shall apply the presumption which is founded on the weightier considerations of policy and logic. If there is no such preponderance, both presumptions shall be disregarded.

(Added by SCO 364 effective August 1, 1979)

### Rule 302. Applicability of Federal Law in Civil Actions and Proceedings.

In civil actions and proceedings, the effect of a presumption respecting a fact which is an element of a claim or defense as to which federal law supplies the rule of decision is determined in accordance with federal law.

(Added by SCO 364 effective August 1, 1979)

### Rule 303. Presumptions in General in Criminal Cases.

#### (a) Effect.

(1) **Presumptions Directed Against an Accused.** In all criminal cases when not otherwise provided for by statute, by these rules or by judicial decision, a presumption directed against the accused imposes no burden of going forward with evidence to rebut or meet the presumption and does not shift to the accused the burden of proof in the sense of the risk of nonpersuasion, which remains throughout the trial upon the party on whom it was originally cast. However, if the accused fails to offer evidence to rebut or meet the presumption, the court must instruct the jury that it may, but is not required to, infer the existence of the presumed fact from the proved fact, but no mention of the word "presumption" shall be made to the jury. If the accused offers evidence to rebut or meet the presumption, the court may instruct the jury that it may, but is not required to, infer the existence of the presumed fact from the proved fact, but no mention of the word "presumption" shall be made to the jury.

(2) **Presumptions Directed Against the Government.** In all criminal cases when not otherwise provided for by statute, by these rules, or by judicial

decision, a presumption directed against the government shall be treated in the same manner as a presumption in a civil case under Rule 301.

(b) **Prima Facie Evidence.** A statute providing that a fact or group of facts is prima facie evidence of another fact establishes a presumption within the meaning of this rule.

(c) **Inconsistent Presumptions.** If two presumptions arise which conflict with each other, the court shall apply the presumption which is founded on the weightier considerations of policy and logic. If there is no such preponderance, both presumptions shall be disregarded.

(Added by SCO 364 effective August 1, 1979)

#### Annotations

#### Cases

Breathalyzer result alone established a prima facie case, entitling the prosecution to go to the jury on the issue of defendant's blood alcohol level at the time of her driving. *Erickson v. Municipality of Anchorage*, Op. No. 238, 662 P2d 963 (Alaska App. 1983).

Expert evidence is not necessary to relate a person's blood alcohol rate at the time a test is administered to the blood-alcohol rate at an earlier time when the person was driving. *Erickson v. Municipality of Anchorage*, Op. No. 238, 662 P2d 963 (Alaska App. 1983).

Although a blood-alcohol level in excess of the statutory presumption does not necessarily establish criminal recklessness or culpable negligence as a matter of law, it was not error for the jury in a vehicular manslaughter case to instruct the jury on the statutory presumptions concerning intoxication. *Dresnek v. State*, Op. No. 455, 697 P2d 1059 (Alaska App. 1985).

## ARTICLE IV. ADMISSIBILITY OF RELEVANT EVIDENCE

### Rule 401. Definition of Relevant Evidence.

Relevant evidence means evidence having a 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.

(Added by SCO 364 effective August 1, 1979)

#### Annotations

#### Cases

Where defendant was charged with assault and battery and evidence that victim was 9 months pregnant was relevant to defendant's present ability to inflict a violent injury, based on apprehension on part of the victim and to establish criminal intent and use of unlawful force. *Rathbun v. Anchorage*, Op. No. 197, 622 P2d 751 (Alaska 1979).

At trial for murder, it was reversible error for the trial court to exclude a journal written by the victim, parts of which reflected a sense of mental instability and a violent nature. *Keith v. State*, No. 2099, 612 P2d 977 (Alaska 1980).

Evidence of drug use by the accused was admissible where it established direct contact between the victim and the accused possessed sufficient amounts of cocaine for him to have invested more than pocket cash in his purchase from the victim. *Dorman v. State*, Op. No. 2272, 622 P2d 448 (Alaska 1981).

Testimony and photographs concerning the physical condition of a child allegedly kidnapped by defendant from state custody were admissible to show motive for kidnapping. *Crump v. State*, Op. No. 9, 625 P2d 857 (Alaska 1981).

Evidence of actual sobriety offered to rebut the accuracy of a breathalyzer result is admissible as relevant circumstantial evidence. *Denison v. Anchorage*, Op. No. 32, 630 P2d 1001 (Alaska App. 1982).

Defendant's contention that because his conviction for driving while intoxicated was predicated on his blood alcohol rate and not on driving it was error for the trial court to admit evidence that he drove erratically and appeared intoxicated to arresting officers was properly rejected. *Byrne v. State*, Op. No. 169, 654 P2d 795 (Alaska 1982).

Admissibility of breathalyzer refusals should be determined on a case-by-case basis by weighing probative value against potential for unfair prejudice. *Coleman v. State*, Op. No. 229, 658 P2d 1364 (Alaska App. 1983).

Defendant's resistance to "pat down" search was admissible as evidence that defendant was aware of the cocaine found in his pocket, although there were other possible explanations for his behavior. *Elson v. State*, Op. No. 2615 659 P2d 1195 (Alaska 1983).

In prosecution for murder, admission into evidence of a .380 caliber automatic pistol owned by the defendant was not error even though expert testimony could not conclusively establish that the gun was the murder weapon. *Bangs v. State*, Op. No. 253, 663 P2d 981 (Alaska App. 1983).

In drunk driving prosecution of defendant who refused to submit to a breathalyzer examination, court erred in excluding expert testimony for the defense concerning defendant's blood alcohol level at the time of his arrest. *Quinto v. City and Borough of Juneau*, Op. No. 265, 664 P2d 630 (Alaska App. 1983).

In prosecution for driving with a suspended license, attempted use by prosecution for impeachment purposes of voluntary statements made by defendant at the arrest scene concerning the reason she was driving, but which statements did not include the reason she later cited for driving, presented a question of whether the evidence was relevant and whether its probative value outweighed its prejudicial effect. *Nelson v. State*, Op. No. 427, 691 P2d 1056 (Alaska App. 1984).

Where defendant in murder trial claimed that he was defending himself against a homosexual rape by the victim who lured him into a car by offering him Quaaludes, trial court erred in excluding the testimony of a witness who would have testified that he had had a similar encounter with the victim one year before, and the trial court also erred in excluding evidence that the police found Quaaludes in the victim's home during their investigation. *Williamson v. State*, Op. No. 430, 692 P2d 965 (Alaska App. 1984).

Where defense strategy was to show that an alcoholic blackout prevented defendant from formulating an intent to kill, court did not err in rejecting lay testimony which defendant offered to establish the existence of alcoholic blackouts, since it would not have shed any light on the dispute between the experts who testified on the subject, nor would it have made it more or less probable that defendant was unable to form an intent to kill at the time of the shooting in question. *Staal v. State*, Op. No. 454, 697 P2d 1050 (Alaska App. 1985).

In negligence action where defendant alleged that the accident was caused by a design defect in her automobile which caused it to accelerate spontaneously, consumer complaint reports to the National Highway Traffic Safety Agency of similar incidents involving the same type of automobile were relevant and admissible as hearsay exceptions. *Narris v. Gatts*, Op. No. 3187, 738 P2d 344 (Alaska 1987).

In prosecution of defendant for lewd and lascivious acts toward children in which it was alleged that defendant would invite them to his house, offer them drugs, show them pornographic materials, and then attempt sexual acts with them, trial court did not abuse its discretion in refusing to allow defendant to call as witnesses two police officers who had been in his home at different times and who would have testified that they had not seen drugs, pornography, or porn-making equipment in his home. *Rodriguez v. State*, Op. No. 735, 741 P2d 1200 (Alaska App. 1987).

## Rule 402. Relevant Evidence Admissible— Exceptions—Irrelevant Evidence Inadmissible.

All relevant evidence is admissible, except as otherwise provided by the Constitution of the United States or of this state, by enactments of the Alaska Legislature, by these rules, or by other rules adopted by the Alaska Supreme Court. Evidence which is not relevant is not admissible.

(Added by SCO 364 effective August 1, 1979)

### Annotations

#### Cases

Admission of evidence which had some tendency to establish an ultimate issue was not error, even though relevance of such evidence was marginal. *Alyeska Pipeline Service v. Aurora Air Service*, Op. No. 2004, 604 P2d 1090 (Alaska 1979).

The evidencing rule precluding admission of post-injury accidents or design changes toward proof of negligence is inapplicable in products liability cases based on strict liability. *Caterpillar Tractor Co. v. Beck*, Op. No. 2304, 624 P2d 790 (Alaska 1981).

Evidence offered by defendant to show reasonableness of defendant's apprehension of being in imminent danger from shooting victim is not relevant when defendant did not know of such evidence at the time of the shooting. *Byrd v. State*, Op. No. 2184, 626 P2d 1057 (Alaska 1980).

Although the presentation of irrelevant evidence as to the scope of burglaries is error, it is harmless error if the presentation produces little or no prejudicial effect. *Nelson v. State*, Op. No. 2350, 628 P2d 884 (Alaska 1981).

Admissibility of breathalyzer refusals should be determined on a case-by-case basis by weighing probative value against potential for unfair prejudice. *Coleman v. State*, Op. No. 229, 658 P2d 1364 (Alaska App. 1983).

In prosecution for murder, admission into evidence of a .380 caliber automatic pistol owned by the defendant was not error even though expert testimony could not conclusively establish that the gun was the murder weapon. *Bangs v. State*, Op. No. 253, 663 P2d 981 (Alaska App. 1983).

In drunk driving prosecution of defendant who refused to submit to a breathalyzer examination, court erred in excluding expert testimony for the defense concerning defendant's blood alcohol level at the time of his arrest. *Quinto v. City and Borough of Juneau*, Op. No. 265, 664 P2d 630 (Alaska App. 1983).

Defendant's conviction for sexual abuse of child was reversed because extensive evidence of prior consistent statements made by the victim was admitted at trial without any determination of its actual probative value and before any charge of recent fabrication or improper motive or influence was made against the victim. *Nitz v. State*, Op. No. 629, 720 P2d 55 (Alaska App. 1986).

Evidence of consistent statements made by a child abuse victim on prior occasions may be admitted to bolster the testimony of the victim in a case involving the sexual abuse of the child, provided that it is actually relevant to rebut an express or implied charge of recent fabrication or improper motive or influence, and provided that its probative value outweighs its potential for prejudicial

impact before such evidence is admitted, however, the victim must testify and be subjected to a charge of recent fabrication or improper motive or influence; furthermore when it appears that the alleged motive to testify falsely arose before the prior statement was made, the statement may be admitted only for the purpose of rehabilitating the victim's credibility and may not be considered as substantive evidence of guilt. *Nitz v. State*, Op. No. 629, 720 P2d 55 (Alaska App. 1986).

### Rule 403. Exclusion of Relevant Evidence on Grounds of Prejudice, Confusion, or Waste of Time.

Although relevant, evidence may be excluded if its probative value is outweighed by the danger of unfair prejudice, confusion of the issues, or misleading the jury, or by considerations of undue delay, waste of time, or needless presentation of cumulative evidence.

(Added by SCO 364 effective August 1, 1979)

#### Annotations

#### Cases

Where only prejudice was possibility that jury might misestimate probative value of certain real evidence for state's case, even slight probative value outweighed such prejudice. *Eben v. State*, Op. No. 1920, 599 P2d 700 (Alaska 1979).

Where informant's credibility was relatively unimportant because testimony was corroborated by police officer's evidence that informant had made written statement alleging informant's testimony before grand jury in unrelated case was product of police coercion was properly excluded on grounds whatever relevancy statement had to issue of informant's credibility was outweighed by likelihood it would confuse the issues, mislead jury and consume an undue amount of time. *Taylor v. State*, Op. No. 1932, 600 P2d 5 (Alaska 1979).

Where defendant was charged with assault and battery, evidence that victim was 9 months pregnant was relevant and not unfairly prejudicial to right of defendant. *Rathbun v. Anchorage*, Op. No. 1928, 599 P2d 751 (Alaska 1979).

Exclusion of relevant evidence concerning rape victim's poor grades and excessive school absenteeism was proper where other evidence had already made the jury aware of these factors. *Alexander v. State*, Op. No. 2077, 611 P2d 469 (Alaska 1980).

Evidence regarding prior confrontations between the defendant and trespassers was relevant and admissible to show that the defendant's pointing of a shotgun at the victim was not accidental or inadvertent. *Adkinson v. State*, Op. No. 2090, 611 P2d 528 (Alaska 1980).

At trial for murder, it was reversible error for the trial court to exclude a journal written by the victim, parts of which reflected a sense of mental instability and a violent nature. *Keith v. State*, Op. No. 2099, 612 P2d 977 (Alaska 1980).

Evidence of the circumstances of a prior rape committed by the defendant was properly admitted for the purpose of providing the identity of the assailant by showing a distinctive modus operandi employed in both the prior rape and the rape of the current victim. *Coleman v. State*, Op. No. 2190, 621 P2d 869 (Alaska 1980).

Evidence of drug use by the accused was admissible where it established direct contact between the victim and the accused and indicated that the accused possessed sufficient amounts of cocaine for him to have invested more than pocket cash in his purchase from the victim. *Dorman v. State*, Op. No. 2272, 622 P2d 448 (Alaska 1981).

The evidentiary rule precluding admission of post-injury accidents or design changes toward proof of negligence is inapplicable in products liability cases based on strict liability. *Caterpillar Tractor Co. v. Beck*, Op. No. 2304, 624 P2d 700 (Alaska 1981).

In statutory rape case, evidence of defendant's prior sexual conduct with victim was admissible. *Burke v. State*, Op. No. 2194, 624 P2d 1240 (Alaska 1981).

Testimony and photographs concerning the physical condition of a child allegedly kidnapped by defendant from state custody were admissible to show motive for kidnapping. *Crump v. State*, Op. No. 2309, 625 P2d 857 (Alaska 1981).

It was not error for the court to allow a defendant charged with drunk driving to be cross-examined regarding a possible lawsuit against the City of Fairbanks arising out of the same incident upon which the drunk driving charge was based. *Roth v. State*, Op. No. 13, 626 P2d 583 (Alaska 1981).

The trial court has considerable discretion in determining whether the probative value of an admission by silence is outweighed by the danger of unfair prejudice. *Dolsher v. State*, Op. No. 30, 632 P2d 242 (Alaska App. 1982).

Evidence that defendant, charged with driving while intoxicated, refused to take the breathalyzer examination had possible probative value, and trial court did not err in finding that the probative value outweighed the possibility of prejudice. *Williford v. State*, Op. No. 148, 653 P2d 339 (Alaska App. 1982).

Where the evidence in each of five rape and assault incidents was sufficiently similar and sufficiently unusual when viewed in its totality and in the common pattern it presented to constitute a modus operandi probative of defendant being the assailant in all instances, trial court did not err in denying defendant's request for severance of the various rape, burglary with intent to rape, and assault charges. *Nix v. State*, Op. No. 157, 653 P2d 1092 (Alaska App. 1982).

Defendant's contention that because his conviction for driving while intoxicated was predicated on his blood alcohol rate and his driving it was error for the trial court to admit evidence that he drove erratically and appeared intoxicated to arresting officers was properly rejected. *Byrne v. State*, Op. No. 169, 654 P2d 795 (Alaska App. 1982).

This rule, when properly applied and which excludes evidence which is minimally relevant, does not violate a defendant's constitutional right to confront the witnesses against him and to present evidence in his own behalf. *Larson v. State*, Op. No. 177, 654 P2d 571 (Alaska App. 1982).

Evidence that victim had assisted defendant in forging a prescription and that defendant's friend had previously assisted a pharmacist in attempting to pass the forged prescription was admissible to show defendant's motive for kidnapping. *Biowell v. State*, Op. No. 199, 656 P2d 592 (Alaska App. 1982).

Admissibility of breathalyzer refusals should be determined on a case-by-case basis by weighing probative value against danger of unfair prejudice. *Coleman v. State*, Op. No. 229, 658 P2d 1000 (Alaska App. 1983).

Defendant's resistance to "pat down" search was admissible evidence that defendant was aware of the cocaine found in pocket, although there were other possible explanations for his behavior. *Elson v. State*, Op. No. 2615, 659 P2d 1195 (Alaska App. 1983).

In damage action involving allegedly defective crane, testimony by defendant on the brake system of the crane to determine the capabilities of such cranes in general, and not to have drawn conclusions about the particular crane, were properly excluded due to the danger of unfair prejudice, because the procedure was slipshod, because the tests were performed on a particular crane involved in the accident, and because the evidence was cumulative. *Yukon Equipment v. Gordon*, Op. No. 243, 624 P2d 428 (Alaska 1983).

In assault prosecution in which defendant claimed self-defense, trial judge did not err in granting protective orders which prevented defendant from questioning victim about charges for possession

shotgun while intoxicated and assault with a dangerous weapon which were pending against the victim at the time of trial and from asking the victim about prior alcoholism and convictions for driving while intoxicated. *Dyer v. State*, Op. No. 268, 666 P2d 438 (Alaska App. 1983).

In prosecution for murder, admission into evidence of a .380 caliber automatic pistol owned by the defendant was not error even though expert testimony could not conclusively establish that the gun was the murder weapon. *Bangs v. State*, Op. No. 253, 663 P2d 411 (Alaska App. 1983).

Court did not abuse its discretion in limiting cross-examination of prosecution witness concerning the dismissal or lenient disposition of previous charges against the witness absent evidence that the lenient dispositions had been received in return for past cooperation, where the jury was already aware that the witness was being treated favorably by the prosecution in return for his testimony. *Murlock v. State*, Op. No. 256, 664 P2d 589 (Alaska App. 1983).

In drunk driving prosecution of defendant who refused to submit to a breathalyzer examination, court erred in excluding expert testimony for the defense concerning defendant's blood alcohol level at the time of his arrest. *Quinto v. City and Borough of Juneau*, Op. No. 265, 664 P2d 67 (Alaska App. 1983).

The standard for appellate review of a trial court's decision to exclude testimony is whether the court abused its discretion. *Alaska Northern Development, Inc. v. Alyeska Pipeline Service Co.*, Op. No. 2689, 666 P2d 33 (Alaska 1983).

In prosecution for assault with a dangerous weapon, trial court did not abuse its discretion in determining that the probative value of defendant's flight from the crime outweighed the danger of unfair prejudice. *Dyer v. State*, Op. No. 268, 666 P2d 438 (Alaska App. 1983).

In action against state concerning alleged negligent inspection, trial court did not err in allowing expert to state his opinion as to whether the inspection was negligent, where the opinion was helpful to the trier of fact, was based upon facts or data reasonably relied on by other experts, and was not unduly prejudicial or misleading, particularly where any possible confusion or prejudice was cured by precluding the expert's opinion on a standard of care and issuing a cautionary instruction. *Wilson v. State*, Op. No. 2720, 669 P2d 1292 (Alaska 1983).

Complaining witness to crime, who prior to trial had been hypnotized to refresh her recollection, was not incompetent to testify at trial as to her after-hypnosis identification of the assailant. *State v. Contreras*, Op. No. 318, 674 P2d 792 (Alaska App. 1983).

Trial judge in drunk driving prosecution did not abuse his discretion in refusing to admit transcript of expert testimony on breathalyzer machine's failure point to counter testimony by police officer on the same subject even if the evidence was within the former testimony exception to the hearsay rule. *Thayer v. Municipality of Anchorage*, Op. No. 395, 686 P2d 721 (Alaska App. 1984).

In tort action where issue was whether plaintiff's injuries were caused solely by his own intoxication, evidence that plaintiff had previously undergone alcohol treatment was admissible. *Loof v. Sanders*, Op. No. 2859, 686 P2d 1205 (Alaska 1984).

Trial judge did not abuse his discretion in refusing to admit expert testimony that pimps would rather settle disputes among themselves than go to the police since the jurors themselves would certainly have arrived at that conclusion. *Wortham v. State*, Op. No. 414, 689 P2d 1133 (Alaska App. 1984).

In prosecution for driving with a suspended driver's license, trial judge abused his discretion in allowing admission of defendant's two recent convictions for driving while intoxicated which led to the license suspension. *Nelson v. State*, Op. No. 427, 691 P2d 1056 (Alaska App. 1984).

In prosecution for driving with a suspended license, attempted use by prosecution for impeachment purposes of voluntary statements made by defendant at the arrest scene concerning the reason she was driving, but which statements did not include the reason she later cited for driving, presented a question of whether the

evidence was relevant and whether its probative value outweighed its prejudicial effect. *Nelson v. State*, Op. No. 427, 691 P2d 1056 (Alaska App. 1984).

Where defendant in murder trial claimed that he was defending himself against a homosexual rape by the victim who lured him into a car by offering him Quaaludes, trial court erred in excluding the testimony of a witness who would have testified that he had had a similar encounter with the victim one year before, and the trial court also erred in excluding evidence that the police found Quaaludes in the victim's home during their investigation. *Williamson v. State*, Op. No. 430, 692 P2d 965 (Alaska App. 1984).

When a prior bad act is relevant to a material fact other than propensity, the court may admit the evidence if it is more probative than prejudicial. *Lerchenstein v. State*, Op. No. 453, 697 P2d 312 (Alaska App. 1985).

Trial court's limiting curative instruction was not sufficient to remove the prejudice presented by improperly admitted evidence. *Lerchenstein v. State*, Op. No. 453, 697 P2d 312 (Alaska App. 1985).

In murder trial where self-defense was the issue, admission of evidence of recent prior bad acts of the defendant toward persons other than the victim was error notwithstanding the state's contention that the evidence was relevant to the question of whether defendant carried a gun to the crime scene in anticipation of a confrontation or merely pulled it from its customary place under his car seat and also relevant to defendant's state of mind at the time of the offense, since the evidence was to some extent cumulative and its prejudicial impact outweighed its probative value. *Lerchenstein v. State*, Op. No. 453, 697 P2d 312 (Alaska App. 1985).

Where defense strategy was to show that an alcoholic blackout prevented defendant from formulating an intent to kill, court did not err in rejecting lay testimony which defendant offered to establish the existence of alcoholic blackouts, since it would not have shed any light on the dispute between the experts who testified on the subject, nor would it have made it more or less probable that defendant was unable to form an intent to kill at the time of the shooting in question. *Stael v. State*, Op. No. 454, 697 P2d 1050 (Alaska App. 1985).

Admission of evidence that defendant failed to appear for a hearing, filed the jurisdiction after being charged with robbery, and used an alias when subsequently arrested on a different charge was not error. *Lipscomb v. State*, Op. No. 477, 700 P2d 1298 (Alaska App. 1985).

Where defendant was charged with sexual offenses against his daughter, evidence of alleged sexual relations between defendant and his daughter before and after the dates specified in the indictment was admissible to establish the ongoing relationship between the defendant and his daughter, explaining in part the daughter's inability to specifically describe separate incidents. *Covington v. State*, Op. No. 491, 703 P2d 436 (Alaska App. 1985).

In a trial for possession of cocaine with intent to distribute, a detailed analysis of the many items available for sale at defendant's drug paraphernalia business was unduly prejudicial. *Adams v. State*, Op. No. 525, 706 P2d 1183 (Alaska App. 1985).

DWI defendant's testimony that as a truck driver he could not afford the penalty of having his license revoked should have been excluded under this rule. *Browning v. State*, Op. No. 520, 707 P2d 266 (Alaska App. 1985).

Trial court did not err in permitting the prosecution to cross examine defense witness concerning earlier allegations that defendant had sexually molested her for the purpose of impeaching her testimony that she did not believe the victim's claim of molestation and to counter defendant's testimony of accident or mistake. *Moor v. State*, Op. No. 543, 709 P2d 498 (Alaska App. 1985).

Where defendant cross-examined the prosecution witness, his former girlfriend, concerning their bitter breakup in order to establish her bias, trial court had erred in then allowing the state on redirect to inquire into all of the circumstances of the breakup, since it exceeded the scope of redirect permissible under the doctrine of

curative admissibility, which exists to permit introduction of otherwise inadmissible evidence only to the extent necessary to remove any unfair prejudice which might otherwise ensue from the original evidence. *Bentley v. State*, Op. No. 560, 711 P2d 544 (Alaska App. 1985).

In prosecution of defendant for manslaughter for causing the death of the 18-month-old son of his live-in girlfriend, trial judge did not abuse his discretion in admitting evidence which tended to indicate that defendant had abused the child on prior occasions. *Garner v. State*, Op. No. 569, 711 P2d 1191 (Alaska App. 1986).

In prosecution of defendant for manslaughter in the death of the 18-month-old son of his live-in girlfriend, trial judge abused his discretion by precluding defendant from offering extrinsic evidence that a neighbor, who had also taken care of the child on the day the fatal injuries were inflicted, had abused her own child on prior occasions, since such evidence was critical to defendant's defense, which suggested that the neighbor had inflicted the fatal injuries. *Garner v. State*, Op. No. 569, 711 P2d 1191 (Alaska App. 1986).

Evidence that defendant in sexual assault case had made sexual propositions to several other young girls was admissible to show design, scheme or plan, but not to establish motive. *Oswald v. State*, Op. No. 594, 715 P2d 276 (Alaska App. 1986).

Although trial court allowed testimony by sexual assault victim as to her virginity prior to the assault, it did not err in precluding defendant from cross-examining the victim regarding a prior incident in which the victim had allegedly been digitally penetrated by a school friend, since the probative value of the earlier incident as an alternative explanation for the perforation of the victim's hymen was very weak while the possible prejudice from invading her privacy unnecessarily and confusing the issues was very high. *Oswald v. State*, Op. No. 594, 715 P2d 276 (Alaska App. 1986).

Where purpose of allowing police officer to testify concerning out-of-court statement by child victim in sexual assault case was not to prove the truth of the matter asserted in the statement, i.e. that the child had engaged in fellatio with her father, but rather to establish that the child knew what a penis was, the testimony was admissible. *Drumbarger v. State*, Op. No. 601, 716 P2d 6 (Alaska App. 1986).

Trial court did not abuse its discretion in finding that the probative value of admitting photographs of alleged child abuse victim's injuries outweighed the danger of unfair prejudice. *Sluka v. State*, Op. No. 606, 717 P2d 394 (Alaska App. 1986).

In prosecution for assault, trial court's order excluding inquiry into a prior false report by the complaining witness against the defendant for assault did not amount to reversible error, since such inquiry would have allowed the prosecution to elicit a full explanation of the circumstances underlying the prior report to defendant's disadvantage. *Richey v. State*, Op. No. 611, 717 P2d 407 (Alaska App. 1986).

Circumstances surrounding death of defendant's first child from a skull fracture while alone with defendant was admissible in trial of defendant for first degree assault against his second child, who also suffered a skull fracture while alone in defendant's care, to show that defendant's actions manifested an extreme indifference to human life. *Rhodes v. State*, Op. No. 613, 717 P2d 422 (Alaska App. 1986).

When a witness has been previously hypnotized, his subsequent testimony at trial, as to facts and recollections adduced during hypnosis, is inadmissible; he may testify only to facts which he related prior to hypnosis. *Contreras v. State*, Op. No. 3042, 718 P2d 129 (Alaska 1986).

Error in jury instruction together with error in admission of certain character evidence constituted plain error. *Pletnikoff v. State*, Op. No. 625, 719 P2d 1039 (Alaska App. 1986).

Defendant's conviction for sexual abuse of child was reversed because extensive evidence of prior consistent statements made by the victim was admitted at trial without any determination of its actual probative value and before any charge of recent fabrication or improper motive or influence was made against the victim. *Nitz v. State*, Op. No. 629, 720 P2d 55 (Alaska App. 1986).

Evidence of consistent statements made by a child abuse victim on prior occasions may be admitted to bolster the testimony of the victim in case involving the sexual abuse of the child, provided that it is actually relevant to rebut an express or implied charge of recent fabrication or improper motive or influence, and provided that its probative value outweighs its potential for prejudicial impact, before such evidence is admitted, however, the victim must testify and be subjected to a charge of recent fabrication or improper motive or influence; furthermore when it appears that the alleged motive to testify falsely arose before the prior statement was made, the statement may be admitted only for the purpose of rehabilitating the victim's credibility and may not be considered as substantive evidence of guilt. *Nitz v. State*, Op. No. 629, 720 P2d 55 (Alaska App. 1986).

Evidence of sexual acts which the defendant allegedly committed with victims other than those named in the indictment was not relevant to a material fact other than propensity, thus admission of the evidence constituted reversible error. *Bolden v. State*, Op. No. 632, 720 P2d 957 (Alaska App. 1986).

Where defendant was charged with sexually molesting his daughters, admission of evidence concerning his alleged sexual molestation of other young girls was reversible error, since neither intent nor identity were at issue and since the alleged acts were not admissible as evidence of a common scheme or plan. *Bolden v. State*, Op. No. 632, 720 P2d 957 (Alaska App. 1986).

In trial of defendant for sexual abuse of a six-year-old, trial court committed reversible error in allowing the State to present evidence of a prior uncharged sexual incident involving defendant and the same girl 18 months earlier. *Johnson v. State*, Op. No. 655, 727 P2d 1062 (Alaska App. 1986).

In sexual assault case where the defendant was the alleged victim's father, the "lewd disposition" exception to the exclusionary rule was properly extended to allow the testimony of the victim's sisters who were allegedly seduced under substantially similar circumstances and at roughly the same age. *Soper v. State*, Op. No. 675, 731 P2d 587 (Alaska App. 1987).

Evidence that defendant has been convicted of sexually assaulting the same girl two years prior to the incidents alleged in current indictment for sexual abuse was properly admissible before the grand jury and at trial to establish that defendant had a significant sexual desire for that particular girl. *Patterson v. State*, Op. No. 681, 732 P2d 1102 (Alaska App. 1987).

Admission of racial statement made by defendant to police officer was error since the statement was more prejudicial than probative, but the error was harmless in light of the substantial evidence of defendant's guilt. *Ward v. State*, Op. No. 685, 733 P2d 625 (Alaska App. 1987).

In prosecution for resisting arrest where the issue of defendant's intoxication was not part of the prosecution's case-in-chief, and first raised during defendant's own testimony, the trial court did not abuse its discretion in allowing a videotape of defendant at the police station following his arrest to be used by the prosecution to rebut defendant's testimony that he had consumed alcohol and was not influenced by it. *Carson v. State*, Op. No. 700, 736 P2d 102 (Alaska App. 1987).

In sexual assault prosecution where the defense was that the trial judge did not abuse his discretion in excluding evidence that the victim had posed for Penthouse Magazine and had appeared in X-rated movies and had willingly told same to the defendant, the defense offered for the purpose of showing that the defendant and the victim in the months prior to the assault had been in a relationship that was sexual, rather than merely platonic, alleged by the victim. *Wood v. State*, Op. No. 701, 736 P2d 103 (Alaska App. 1987).

In prosecution of defendant for lewd and lascivious acts with children in which it was alleged that defendant would invite children to his house, offer them drugs, show them pornographic material, and then attempt sexual acts with them, trial court did not abuse its discretion in refusing to allow defendant to call as witnesses police officers who had been in his home at different times.

ould have testified that they had not seen drugs, pornography, or  
n-making equipment in his home. *Rodriguez v. State*, Op. No.  
75, 741 P2d 1200 (Alaska App. 1987).

In prosecution for attempted sexual abuse of a minor, trial court  
ed in allowing testimony about statements defendant made one  
ek after the incident concerning his sexual fantasies and orienta-  
n since the testimony was clearly character evidence and was not  
levant to show proof of motive, opportunity, intent, preparation,  
an, knowledge, identity or absence of mistake or accident; nev-  
theless, due to the strength of the other evidence against defend-  
at the error was deemed harmless. *Stevens v. State*, Op. No. 773,  
75 P2d 771 (Alaska App. 1988).

In action by union worker against the union for intentional  
nfection of emotional distress during a strike, testimony by  
another worker concerning episodes of violence aimed at that  
orker during the strike was relevant not to prove the facts asserted  
ut to prove defendant's resultant state of mind based on the  
idents related to him by the other worker, and the trial court  
eressed proper discretion in admitting the testimony on the basis  
at its probative value outweighed the danger of unfair prejudice.  
eamsters Local 959 v. Wells, Op. No. 3263, 749 P2d 349 (Alaska  
1988).

When a complaining witness testifies that he or she has been the  
subject of sexual or physical abuse and the defense seeks to discredit  
his testimony by showing that the witness' conduct was inconsis-  
tent with the claimed abuse and therefore that the claim of abuse  
was false, the state should be permitted to offer expert testimony  
that other members of the relevant class (i.e., abused or battered  
women or sexually abused children) characteristically exhibit such  
conduct even though they are, in fact, abused. *Anderson v. State*,  
Op. No. 771, 749 P2d 369 (Alaska App. 1988).

Before expert testimony seeking to establish that a person is a  
member of a particular class or group, i.e., battered women or  
sexually abused children, by showing that they exhibit behavioral  
characteristics common to that group, the proponent should estab-  
lish, on a hearing out of the presence of the jury, that the probative  
value of the testimony outweighs its possible prejudicial effect; the  
trial court should require the proponent of such evidence to identify  
in advance what he or she intends to prove and why that evidence  
would be relevant to the case; furthermore, the court should con-  
sider the extent to which the expert witnesses' assumptions are  
shared by a consensus of those mental health practitioners knowl-  
edgeable about the subject matter. *Anderson v. State*, Op. No. 771,  
749 P2d 369 (Alaska App. 1988).

#### Rule 404. Character Evidence Not Admissible to Prove Conduct—Exceptions—Other Crimes.

(a) **Character Evidence Generally.** Evidence of a person's character or a trait of his character is not admissible for the purpose of proving that he acted in conformity therewith on a particular occasion, except:

(1) *Character of Accused.* Evidence of a relevant trait of his character offered by an accused, or by the prosecution to rebut the same;

(2) *Character of Victim.* Evidence of a relevant trait of character of a victim of crime offered by an accused, or by the prosecution to rebut the same, or evidence of a character trait of peacefulness of the victim offered by the prosecution in a homicide case to rebut evidence that the victim was the first aggressor, subject to the following procedure:

(i) When a party seeks to admit the evidence for any purpose, he must apply for an order of the court at any time before or during the trial or preliminary hearing.

(ii) The court shall conduct a hearing outside the presence of the jury in order to determine whether the probative value of the evidence is outweighed by the danger of unfair prejudice, confusion of the issues, or unwarranted invasion of the privacy of the victim. The hearing may be conducted *in camera* where there is a danger of unwarranted invasion of the privacy of the victim.

(iii) The court shall order what evidence may be introduced and the nature of the questions which shall be permitted.

(iv) In prosecutions for the crime of sexual assault in any degree and attempt to commit sexual assault in any degree, evidence of the victim's conduct occurring more than one year before the date of the offense charged is presumed to be inadmissible under this rule, in the absence of a persuasive showing to the contrary.

(3) *Character of Witness.* Evidence of the character of a witness, as provided in Rules 607, 608, and 609.

(b) **Other Crimes, Wrongs, or Acts.** Evidence of other crimes, wrongs, or acts is not admissible to prove the character of a person in order to show that he acted in conformity therewith. It may, however, be admissible for other purposes, such as proof of motive, opportunity, intent, preparation, plan, knowledge, identity, or absence of mistake or accident.

(Added and amended by SCO 364 effective August 1, 1979)

#### Annotations

##### Cases

In prosecution for negligent homicide of 18-month-old child, where no defense of accident or mistake was raised, admission of evidence that defendant had on a prior occasion beaten another child to the point of leaving belt marks was reversible error. *Harvey v. State*, Op. No. 1096, 604 P2d 586 (Alaska App. 1979).

Evidence regarding prior confrontations between the defendant and trespassers was relevant and admissible to show that the defendant's pointing of a shotgun at the victim was not accidental or inadvertent. *Adkinson v. State*, Op. No. 2090, 611 P2d 528 (Alaska App. 1980).

The giving of a jury instruction which drew attention to possible prejudicial inadmissible information regarding the accused was prejudicial error. *Keith v. State*, Op. No. 2099, 612 P2d 977 (Alaska App. 1980).

A defendant may offer evidence of a relevant character trait of a victim without its having the effect of granting to the prosecution the right to introduce evidence of defendant's character. *Keith v. State*, Op. No. 2099, 612 P2d 977 (Alaska 1980).

An unintentional reference at trial to defendant's probation did not violate this rule to the extent that a motion for mistrial should have been granted. *Preston v. State*, Op. No. 2146, 615 P2d 594 (Alaska 1980).

**Rule 702. Testimony by Experts.**

(a) If scientific, technical, or other specialized knowledge will assist the trier of fact to understand the evidence or to determine a fact in issue, a witness qualified as an expert by knowledge, skill, experience, training, or education, may testify thereto in the form of an opinion or otherwise.

(b) No more than three expert witnesses may testify for each side as to the same issue in any given case, unless the judge permits an additional number of witnesses to testify as experts.

(Added by SCO 364 effective August 1, 1979; amended by SCO 793 effective March 15, 1987)

**Annotations****Cases**

In action against state concerning alleged negligent inspection, trial court did not err in allowing expert to state his opinion as to whether the inspection was negligent, where the opinion was helpful to the trier of fact, was based upon facts or data reasonably relied on by other experts, and was not unduly prejudicial or misleading, particularly where any possible confusion or prejudice was cured by predicated the expert's opinion on a standard of care and issuing a cautionary instruction. *Wilson v. State*, Op. No. 2720, 669 P2d 1292 (Alaska 1983).

Trial judge did not abuse his discretion in refusing to admit expert testimony that pimps would rather settle disputes among themselves than go to the police since the jurors themselves would certainly have arrived at that conclusion. *Wortham v. State*, Op. No. 414, 689 P2d 1133 (Alaska App. 1984).

Trial court is vested with considerable latitude to decide whether an expert should be allowed to testify; the court's decision is reviewable only for an abuse of discretion. *New v. State*, Op. No. 587, 714 P2d 378 (Alaska App. 1986).

Trial court did not abuse its discretion in excluding expert testimony of former truck driver in support of defendant's "point of no return" defense to manslaughter charge arising out of defendant's failure to stop his truck at a red light, since the testimony would have been cumulative, could have confused the jury, and in any case concerned a common sense concept readily capable of being understood by lay persons. *New v. State*, Op. No. 587, 714 P2d 378 (Alaska App. 1986).

There is no requirement that a witness possess a particular license or academic degree in order to qualify as an expert; the criterion in determining whether a person qualifies as an expert is whether the fact finder can receive appreciable help from that person. *Dymenstein v. State*, Op. No. 624, 720 P2d 42 (Alaska App. 1986).

Trial court at sentencing hearing did not err in allowing police officer to testify as an expert on the subject of pedophilia, even though his expertise was based on police investigation rather than academic studies. *Dymenstein v. State*, Op. No. 624, 720 P2d 42 (Alaska App. 1986).

Witness with credentials in the area of electronic engineering and computer technology who had experience with vehicle operating systems was qualified to be an expert witness in a negligence action against a driver of an Audi 5000 automobile who contended that the automobile had spontaneously accelerated through no fault of her own. *Norris v. Gatts*, Op. No. 3187, 738 P2d 344 (Alaska 1987).

**Rule 703. Basis of Opinion Testimony by Experts.**

The facts or data in the particular case upon which an expert bases an opinion or inference may be those perceived by or made known to him at or before the hearing. Facts or data need not be admissible in evidence, but must be of a type reasonably relied upon by experts in the particular field in forming opinions or inferences upon the subject.

(Added by SCO 364 effective August 1, 1979)

**Annotations****Cases**

Trial court did not commit error in excluding statements made by murder defendant to psychiatrist that he was unable to recall the murder and did not recall other violent incidents which had occurred when he was intoxicated. *Evans v. State*, Op. No. 2505, 645 P2d 155 (Alaska 1982).

In action against state concerning alleged negligent inspection, trial court did not err in allowing expert to state his opinion as to whether the inspection was negligent, where the opinion was helpful to the trier of fact, was based upon facts or data reasonably relied on by other experts, and was not unduly prejudicial or misleading, particularly where any possible confusion or prejudice was cured by predicated the expert's opinion on a standard of care and issuing a cautionary instruction. *Wilson v. State*, Op. No. 2720, 669 P2d 1292 (Alaska 1983).

Consumer complaint reports to the National Highway Traffic Safety Agency, relied upon by an expert witness in a negligence action involving alleged spontaneous acceleration of an Audi 5000 automobile, met the "reasonable reliance" criteria of this rule. *Norris v. Gatts*, Op. No. 3187, 738 P2d 344 (Alaska 1987).

**Rule 704. Opinion on Ultimate Issue.**

Testimony in the form of an opinion or inference, otherwise admissible is not objectionable because it embraces an ultimate issue to be decided by the trier of fact.

(Added by SCO 364 effective August 1, 1979)

**Annotations****Cases**

In action against state concerning alleged negligent inspection, trial court did not err in allowing expert to state his opinion as to whether the inspection was negligent, where the opinion was helpful to the trier of fact, was based upon facts or data reasonably relied on by other experts, and was not unduly prejudicial or misleading, particularly where any possible confusion or prejudice was cured by predicated the expert's opinion on a standard of care and issuing a cautionary instruction. *Wilson v. State*, Op. No. 2720, 669 P2d 1292 (Alaska 1983).

**Rule 705. Disclosure of Facts or Data Underlying Expert Opinion.**

(a) **Disclosure of Facts or Data.** The expert may testify in terms of opinion or inference and give the reasons therefor without prior disclosure of the underlying facts or data, unless the court requires otherwise. The expert may in any event disclose

examination, or be required to disclose on examination, the underlying facts or data, subject to subdivisions (b) and (c).

(b) **Admissibility.** An adverse party may request determination of whether the requirements of Rule 703 are satisfied before an expert offers an opinion or discloses facts or data.

(c) **Balancing Test — Limiting Instructions.** When the underlying facts or data would be inadmissible in evidence for any purpose other than to explain or support the expert's opinion or inference, the court shall exclude the underlying facts or data if the danger that they will be used for an improper purpose outweighs their value as support for the expert's opinion. If the facts or data are disclosed before the jury, a limiting instruction by the court shall be given upon request.

(Added by SCO 364 effective August 1, 1979)

Annotations

Trial court did not commit error in excluding statements made by murder defendant to psychiatrist that he was unable to recall the murder and did not recall other violent incidents which had occurred when he was intoxicated. *Evans v. State*, Op. No. 2505, 85 P2d 155 (Alaska 1982).

In parental rights termination proceeding, testimony of social workers and counselors as to information received from other workers would have been admissible hearsay if the testimony had been offered as expert opinion. *Matter of J.R.B.*, Op. No. 3029, 85 P2d 1170 (Alaska 1986).

Where evidence relied upon by expert witness met the "reasonable reliance" test, trial court's failure to hold a hearing on that issue required by this rule was harmless error. *Norris v. Gatts*, Op. No. 3187, 738 P2d 344 (Alaska 1987).

**Rule 706. Court Appointed Experts.**

(a) **Appointment.** The court may on its own motion or on the motion of any party enter an order to show cause why expert witnesses should not be appointed, and may request the parties to submit nominations. The court may appoint expert witnesses. An expert witness shall not be appointed by the court unless he consents to act. A witness so appointed shall be informed of his duties by the court in writing, a copy of which shall be filed with the clerk, or at a conference in which the parties shall have opportunity to participate. A witness so appointed shall advise the parties of his findings, if any; his deposition may be taken by any party; and he may be called to testify by the court or any party. If the court determines that the interests of justice so require, the party calling an expert appointed under this rule may cross-examine the witness.

(b) **Disclosure of Appointment.** In the exercise of its discretion, the court may disclose to the jury the fact that the court appointed the expert witness.

(c) **Parties' Experts of Own Selection.** Nothing in this rule limits the parties in calling expert witnesses of their own selection.

(Added by SCO 364 effective August 1, 1979)

ARTICLE VIII. HEARSAY

**Rule 801. Definitions.**

The following definitions apply under this article:

(a) **Statement.** A statement is (1) an oral or written assertion or (2) nonverbal conduct of a person, if it is intended by him as an assertion.

(b) **Declarant.** A declarant is a person who makes a statement.

(c) **Hearsay.** Hearsay is a statement, other than one made by the declarant while testifying at the trial or hearing, offered in evidence to prove the truth of the matter asserted.

(d) **Statements Which Are Not Hearsay.** A statement is not hearsay if

(1) *Prior Statement by Witness.* The declarant testifies at the trial or hearing and the statement is

(A) inconsistent with his testimony. Unless the interests of justice otherwise require, the prior statement shall be excluded unless

(i) the witness was so examined while testifying as to give the witness an opportunity to explain or to deny the statement or

(ii) the witness has not been excused from giving further testimony in the action; or

(B) consistent with his testimony and is offered to rebut an express or implied charge against him of recent fabrication or improper influence or motive; or

(C) one of identification of a person made after perceiving him; or

(2) *Admission by Party-Opponent.* The statement is offered against a party and is (A) his own statement, in either his individual or a representative capacity, or (B) a statement of which he has manifested his adoption or belief in its truth, or (C) a statement by a person authorized by him to make a statement concerning the subject, or (D) a statement by his agent or servant concerning a matter within the scope of his agency or employment, made during the existence of the relationship, or (E) a statement by a co-conspirator of a party during the course and in furtherance of the conspiracy.

(Added by SCO 364 effective August 1, 1979)

Equal Access Act could not be applied upon succession that he was employed. (4)(a).

and Traynor, Jr.,  
Attorney General Counsel,

Final order of the Hearing Officer denying the award of attorney's fees filed with the Florida State Department of Justice in violation of the Equal Access to Justice Act, a regulatory proceeding, is hereby affirmed. The hearing officer's decision is affirmed in its entirety.

In December 1986, the Florida State Hospital was the proscipitor of the Florida Statutes for continuation of Unit 1, a Director of the Hospital before possession was held, at which time evidence was presented that Thompson is not a "care-receiving" patient of the Department of Health and was ordered to

petition for attorney's fees under section 57.111. Thompson became "a 'party' in [DOAH] on December 24, 1987, and the order [sustaining] the award. Thompson contended he is an unincorporated business. The hearing officer's finding of the act was affirmed against him

by the Agency involved his livelihood, and involved the Agency's determination, in its regulatory capacity pursuant to Chapter 393, Florida Statutes, that the Respondent did not meet the requirements necessary to engage in his profession." Thompson also contended that the Agency's actions were "substantially unjustified in law and in fact, and [that] no circumstances exist[ed] that would make the requested award unjust." The hearing officer denied the petition for attorney's fees, finding that Thompson did not meet the criteria outlined in § 57.111(3)(d) to be considered a "small business party."

Section 57.111, Fla.Stat. (1987), provides for an award of attorney's fees from the state to a "small business party" under certain circumstances in order to "diminish the deterrent effect of seeking review of, or defending against, governmental action." This section states in part:

(3)(d) The term "small business party" means:

1.a. A sole proprietor of an unincorporated business, including a professional practice, whose principal office is in this state, who is domiciled in this state, and whose business or professional practice has, at the time the action is initiated by a state agency, not more than 25 full-time employees or a net worth of not more than \$2 million, including both personal and business investments;

(e) A proceeding is "substantially justified" if it had a reasonable basis in law and fact at the time it was initiated by a state agency.

(4)(a) Unless otherwise provided by law, an award of attorney's fees and costs shall be made to a prevailing small business party in any adjudicatory proceeding of administrative proceeding pursuant to chapter 120 initiated by a state agency, unless the actions of the agency were substantially justified or special circumstances exist which would make the award unjust.

In this case, the hearing officer correctly found that Thompson did not fall within the statutory definition of "small business party."

There is no evidence to support Thompson's contention that he is the sole proprietor of an unincorporated business, nor does he fit within the definition of partnership or corporation. Rather, the evidence shows that Thompson is a state employee employed on a salaried basis by the Florida State Hospital. By definition, the Florida Equal Access to Justice Act does not apply to individual employees such as Thompson. If the legislature had intended the act to apply to individual employees it could have said so.

We recognize the apparent unfairness in permitting the limited class of persons falling within the definition of "small business party" to recover attorney fees and costs while excluding other persons such as employees of private and governmental entities who are forced to litigate with state agencies. However, Thompson makes no attack on the constitutional validity of the statute; and whether to extend the act's protection beyond the limitations presently imposed by the statute is a matter for legislative, not judicial, action.

**AFFIRMED.**

ERVIN and WENTWORTH, JJ.,  
concur.



Tommie Lee ANDREWS, Appellant,

v.

STATE of Florida, Appellee.

No. 87-2166.

District Court of Appeal of Florida,  
Fifth District.

Oct. 20, 1988.

Rehearing Denied Nov. 22, 1988.

Defendant was convicted in the Circuit Court, Orange County, Rom W. Powell, J.,

of aggravated battery, sexual battery, and armed burglary of a dwelling. Defendant appealed. The District Court of Appeal, Orfinger, J., held that: (1) "genetic fingerprint" evidence was admissible, and (2) charges of aggravated battery and sexual battery arose from discrete acts committed during one transaction and separate convictions and punishments were thus appropriate.

Affirmed.

#### 1. Criminal Law ⇐388(1)

Where a form of scientific expertise has no established "track record" in litigation, courts may look to a variety of factors that may bear on reliability of evidence, including novelty of new technique, i.e., its relationship to more established modes of scientific analysis; existence of specialized literature dealing with technique; qualifications and professional stature of expert witnesses, and nonjudicial uses to which scientific technique are put.

#### 2. Criminal Law ⇐388(2)

"Genetic fingerprint" evidence, by which strands of coding found in genetic molecule of deoxyribonucleic acid (DNA) are compared for purpose of identifying perpetrator of crime was admissible; evidence derived from DNA print identification appeared based on proven scientific principles, there was testimony that the evidence had been used to exonerate those suspected of criminal activity, and test was administered in conformity with accepted scientific procedure so as to ensure to greatest degree possible a reliable result.

#### 3. Criminal Law ⇐726

Prosecutor's comment that no evidence had been presented which provided innocent explanation was proper response to defendant's argument that there was innocent explanation for defendant's fingerprints found on victim's window screen.

#### 4. Criminal Law ⇐29(12), 984(6)

Charges of aggravated battery and sexual battery arose from discrete acts committed during one transaction; there-

fore, separate convictions and punishment were appropriate.

James B. Gibson, Public Defender and Kenneth Witts, Asst. Public Defender Daytona Beach, for appellant.

Robert A. Butterworth, Atty. Gen., Tallahassee and Kellie A. Nielan, Asst. Atty. Gen., Daytona Beach, for appellee.

Andre A. Moenssens, Kilmarnock, Va., for amicus curiae, Lifecodes Corp.

#### ORFINGER, Judge.

The issue in this case concerns the admissibility of "genetic fingerprint" evidence, by which strands of coding found in the genetic molecule of deoxyribonucleic acid (DNA) are compared for the purpose of identifying the perpetrator of a crime. The trial court admitted the evidence, and the jury convicted defendant of aggravated battery, sexual battery and armed burglary of a dwelling. Defendant also contends that his motion for mistrial should have been granted because of an improper comment by the prosecutor, and that he could not be convicted for both aggravated battery and sexual battery arising from the same incident. We conclude that the evidence was properly admitted and that defendant's other issues are without merit, and we affirm.

In the early morning hours of February 21, 1987, the victim was awakened when someone jumped on top of her and held what felt like a straight edge razor to her neck. The intruder, who the victim could only identify at trial as a strong, black male, held his hand over her mouth, told her to keep quiet and threatened to kill her if she saw his face. The victim struggled with the intruder and for her efforts was cut on her face, neck, legs and feet.

The intruder then forced vaginal intercourse with the victim, following which he stole her purse containing about \$40, and then left the house. A physical examination made after the attack was reported to the police revealed the presence of semen in the victim's vagina. A crime lab analyst testified that both the victim and appellant

were blood type O but that appellant like a majority of the population is a secretor (secretes his blood type in his saliva and other body fluids) while the victim was not. Blood type O was found in the vaginal swabs taken from the victim though the analyst conceded that while this result could have come from the semen found in the victim's vagina, it also could have come from the victim's blood picked up by the swab. The analyst concluded that appellant was included in the population (which he stated constituted 65% of the male population) that could be the source of the semen.

A crime scene technician testified that on the morning following the crime one of the windows of the victim's house was open, and the screen was missing. The victim had testified that this window had been broken previously and was held together with wire from a coat hanger. A screen was found on the ground and fingerprints were lifted from it. A fingerprint expert testified that two of the prints lifted from the screen matched appellant's right index and middle finger.

Over objection, the state presented DNA print identification evidence linking appellant to the crime. The DNA test compared the appellant's DNA structure as found in his blood with the DNA structure of the victim's blood and the DNA found in the vaginal swab, taken from the victim shortly after the attack. The test was conducted by Lifecodes Corp., a corporation specializing in DNA identity testing. Dr. Baird of Lifecodes testified to a match between the DNA in appellant's blood and the DNA from the vaginal swab, stating that the percentage of the population which would have the DNA bands indicated by the samples would be 0.0000012%. In other words, the chance that the DNA strands found in appellant's blood would be duplicated in some other person's cells was 1 in 839,914,540.

We have found no other appellate decision addressing the admissibility of DNA identification evidence in criminal cases. Although appellant primarily attacks the methods used by Lifecodes as opposed to

the admissibility of DNA evidence in general, the novelty of the question requires, in our opinion, that we address both issues.

#### (A) ADMISSIBILITY OF A NEW SCIENTIFIC TECHNIQUE—STANDARD

We begin by confessing some uncertainty as to the standard applicable in this state governing admissibility into evidence of a new scientific technique. In the seminal case of *Frye v. United States*, 293 F. 1013 (D.C.Cir.1923), which involved the question of admissibility of lie detector test results, the court, in holding that expert testimony relating to novel scientific evidence must satisfy a special foundational requirement not applicable to other types of expert testimony, declared:

Just when a scientific principle or discovery crosses the line between the experimental and demonstrable stages is difficult to define. Somewhere in the twilight zone the evidential force of the principle must be recognized, and while the 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 to which it belongs.* [Emphasis in original].

293 F. at 1014.

One leading commentator has summarized *Frye* as requiring courts to determine: (1) the status, in the appropriate scientific community, of the scientific principle underlying the proffered novel evidence; (2) the technique applying the scientific principle; and (3) the application of the technique on the particular occasion. Giannelli, *The Admissibility of Novel Scientific Evidence: Frye v. United States: A Half Century Later*, 80 Columbia Law Rev. 1197, 1201 (1980). *Frye* is still applied in a number of jurisdictions, compare *Cobey v. State*, 73 Md.App. 233, 533 A.2d 944 (1987) (state failed to establish that chromosome variant analysis was generally accepted as reliable in relevant scientific community) with *People v. Reilly*, 196 Cal.App.3d 1127, 242 Cal.Rptr. 496 (1987) (sufficient showing

ns and punishments

Public Defender and  
Public Defender,  
pellant.

h, Atty. Gen., Talla-  
Nielan, Asst. Atty.  
for appellee.

s, Kilmarnock, Va.,  
codes Corp.

concerns the admis-  
gerprint" evidence,  
oding found in the  
oxyribonucleic acid  
for the purpose of  
tor of a crime. The  
e evidence, and the  
iant of aggravated  
and armed burglary  
ndant also contends  
nistrial should have  
of an improper com-  
r, and that he could  
oth aggravated bat-  
ry arising from the  
nclude that the evi-  
mitted and that de-  
are without merit,

g hours of February  
was awakened when  
op of her and held  
ht edge razor to her  
who the victim could  
as a strong, black  
ver her mouth, told  
threatened to kill her  
The victim struggled  
for her efforts was  
legs and feet.

forced vaginal inter-  
following which he  
ning about \$40, and  
A physical examina-  
ack was reported to  
presence of semen  
A crime lab analyst  
victim and appellant

made that electrophoretic typing of dried bloodstains had found general acceptance or consensus in scientific community to warrant its introduction), though it has of late come in for criticism by a number of judges and commentators as being too inflexible<sup>1</sup> as well as inconsistent with modern evidence codes. See, e.g., *United States v. Downing*, 753 F.2d 1224 (3d Cir. 1985); *Brown v. State*, 426 So.2d 76, 87-89 (Fla. 1st DCA 1983); Giannelli, *supra*. One judge has suggested that the *Frye* standard should be rejected as a precondition to the admissibility of evidence relating to novel scientific techniques. *Hawthorne v. State*, 470 So.2d 770, 783 (Fla. 1st DCA 1985) (Ervin, C.J., concurring and dissenting in part).

In *Brown v. State*, 426 So.2d 76 (Fla. 1st DCA 1983) Judge Ervin exhaustively reviewed the law in Florida on the applicability of the *Frye* test, concluding that it was unclear whether that test had been accepted by the Florida courts. His review of *Kaminski v. State*, 63 So.2d 339 (Fla.1952), *Coppolino v. State*, 223 So.2d 68 (Fla. 2d DCA 1968), *appeal dismissed*, 234 So.2d 120 (Fla.1969), *cert. denied*, 399 U.S. 927, 90 S.Ct. 2242, 26 L.Ed.2d 794 (1970), and *Jent v. State*, 408 So.2d 1024 (Fla.1981) led him to conclude that the *Frye* test had not been adopted. He added, however that

More recently the Florida Supreme Court cited *Coppolino* as supporting its view that "[a] court should admit evidence of scientific tests and experiments only if the reliability of the results are widely recognized and accepted among scientists." *Stevens v. State*, 419 So.2d 1058, 1063 (Fla.1982). Superficially, it would seem that the above statement embraces the *Frye* rule, yet the court's reliance upon *Coppolino* undercuts that interpretation. Additionally, the statement made in the same paragraph that "[t]he admissibility of a test or experiment lies within the discretion of the trial judge ..." is contrary to *Frye* since a strict adherence

to *Frye* would severely curtail trial court discretion. The latter quoted statement is, moreover, consistent with the court's earlier opinion in *Jent*.

426 So.2d at 87.

In *Jent v. State*, 408 So.2d 1024 (Fla. 1981), the question raised was the admissibility of hair analysis testimony. In rejecting the defense claim that evidence regarding hair analysis was not sufficiently reliable or exact to be allowed into evidence, the court stated:

As a general rule, the problem presented to a trial court is whether scientific tests are so unreliable and scientifically unacceptable that admission of those test results constitutes error. *Coppolino v. State*, 223 So.2d 68 (Fla. 2d DCA 1968), *cert. denied*, 399 U.S. 927, 90 S.Ct. 2242, 26 L.Ed.2d 794 (1970).... A trial court has wide discretion concerning the admissibility of evidence, and, in the absence of an abuse of discretion, a ruling regarding admissibility will not be disturbed.

408 So.2d at 1029. The evidence was held to be admissible despite the testimony that, although the unknown hair found at the scene of the crime was microscopically the same as the defendant's it could not be positively identified as having come from the defendant. The court noted that "[d]etermining what weight to accord this testimony was within the jury's province...."

In *Bundy v. State*, 455 So.2d 330 (Fla. 1984) [*Bundy I*] the court extensively reviewed case law pertaining to the admissibility of hypnotically aided testimony, but declined to decide which test was applicable, finding that the specific testimony involved was admissible because "... this is simply not a case of hypnotically refreshed recall testimony." *Id.* at 341. The court then addressed the admissibility of expert testimony on bite mark comparison evidence. Without specifically referencing *Frye*, the court held such testimony to be admissible and explained:

1. For instance, as Professor Giannelli points out, rigid application of *Frye* would require a court to await the passage of time until such time as the new technique has been developed to the point that it has become "generally ac-

cepted." This creates a "cultural lag" during the technique's development, resulting in the exclusion of evidence which could be completely reliable. Giannelli, *supra* at 1223, nn. 201 and 202.

curtail trial court quoted statement with the court's

So.2d 1024 (Fla. 1981) was the admissibility of testimony. In rejecting evidence regarding the reliability of the evidence sufficiently relied upon into evidence,

problem presented by the use of scientific tests and the scientific unacceptability of those test results. *Coppolino v. State*, 2d DCA 1968), 90 So.2d 2242, 90 S.Ct. 2242, 90 L.Ed.2d 2242. A trial court concerning the admissibility of the evidence, in the absence of a ruling regarding the reliability of the evidence, will not be dis-

vidence was held to be inadmissible. The testimony that the hair found at the microscopic level was such that it could not be identified as having come from the defendant was noted that "[d]etermining the accuracy of this testimony is the province of the jury." 55 So.2d 330 (Fla. 1981). The court extensively relying on the admissibility of the testimony, but a test was applicable to the testimony because "... this is not a newly discovered fact." 341. The court's reliance on the admissibility of expert testimony is specifically referencing each testimony to be admitted:

"cultural lag" during the trial, resulting in the exclusion of the evidence could be completely excluded. 1223, nn. 201 and

The trial court found that the science of forensic odontology, which is based on the discovery that the characteristics of individual human dentition are highly unique, is generally recognized by scientists in the relevant fields and therefore is an acceptable foundation for the admissibility of expert opinions into evidence. The court in effect ruled that since the proffered [sic] evidence met this criterion the details of the comparison techniques were matters of credibility and weight of the evidence for the jury to determine ...

As the trial court found, the basis for the comparison testimony—that the science of odontology makes such comparison possible due to the significant uniqueness of individual dental characteristics—has been adequately established. Appellant does not contest this supposition. Forensic odontology is merely an application of this established science to a particular problem. *People v. Marx* [54 Cal.App.3d 100, 126 Cal.Rptr. 350 (1975)]. The technique is similar to hair comparison evidence, which is admissible even though it does not result in identifications of absolute certainty as fingerprints do. *Jent v. State*, 408 So.2d 1024 (Fla.1981), cert. denied, 457 U.S. 1111, 102 S.Ct. 2916, 73 L.Ed.2d 1322 (1982); *Peek v. State*, 395 So.2d 492 (Fla.1980), cert. denied, 451 U.S. 964, 101 S.Ct. 2036, 68 L.Ed.2d 342

2. The court declared:

We are swayed by the opinions of the courts of other jurisdictions that have held that the concerns surrounding the reliability of hypnosis warrant a holding that this mechanism, like polygraph and truth serum results, has not been proven sufficiently reliable by experts in the field to justify its validity as competent evidence in a criminal trial. Nor can we agree that employing safeguards has been shown to insure that hypnotically recalled testimony is reliable at the present time. The Michigan Supreme Court recently joined the growing number of jurisdictions that hold that the testimony of a witness whose memory has been refreshed through hypnosis is inadmissible. We feel that court's conclusion in *People v. Gonzales*, 415 Mich. 615, 329 N.W.2d 743 (1982), aptly describes our view on this issue. The court stated:

(1981). Its probative value to the case is for the trier of fact to determine.

The trial court also found that the comparison techniques actually used in this case were reliable enough to allow the experts to present their materials and their conclusions to the jury. Bundy has presented no basis for finding that the trial judge abused his discretion in doing so.

455 So.2d at 348-49.

In *Bundy v. State*, 471 So.2d 9 (Fla.1985) [*Bundy II*], the court directly confronted the question of the admissibility of hypnotically aided testimony. While referring to *Frye*, 471 So.2d at 13, the court never specifically declared that it was adopting the *Frye* standard. However, in holding that the testimony was per se inadmissible in criminal trials "because of its basic unreliability," the court drew on language in opinions from jurisdictions that apply *Frye*.<sup>2</sup> See also *Mills v. State*, 476 So.2d 172 (Fla.1985) (results of neutron activation analysis gunshot residue test held admissible with court noting test "has attained sufficient standing among scientists to be accepted as reliable evidence in the courts").

In *Kruse v. State*, 483 So.2d 1383 (Fla. 4th DCA 1986) where the state sought introduction of expert testimony that the child/victim was suffering from a condition known as Post Traumatic Stress Syndrome, the Fourth District employed the relevancy

Hypnosis has not received sufficient general acceptance in the scientific community to give reasonable assurance that the results produced under even the best of circumstances will be sufficiently reliable to outweigh the risks of abuse and prejudice.

... [U]ntil hypnosis gains general acceptance in the fields of medicine and psychiatry as a method by which memories are accurately improved without undue danger of distortion, delusion, or fantasy and until the barriers which hypnosis raises to effective cross-examination are somehow overcome, the testimony of witnesses which has been tainted by hypnosis must be excluded in criminal cases. 471 So.2d at 18. But see *Rock v. Arkansas*, 483 U.S. 44, 107 S.Ct. 2704, 97 L.Ed.2d 37 (1987) (per se exclusion of a criminal defendant's post-hypnotic testimony infringes impermissibly on the right of a defendant to testify on his or her own behalf).

approach based on our evidence code for determining the admissibility of such expert testimony. Noting that the "helpfulness" standard of section 90.702<sup>3</sup> reflects a liberal policy in the admission of expert testimony, the court held:

With some qualification, we believe the relevancy approach set out in the evidence code is the appropriate standard for determining the admissibility of expert testimony on child sexual abuse. The statutory relevancy standard also comports with the holdings of the Florida Supreme Court in the area of expert testimony. The court has stated that while trial courts have broad discretion in determining the range of subjects on which an expert may testify, such testimony should usually be received only where the disputed issue for which the evidence is offered, is beyond the ordinary understanding of the jury. *Johnson v. State*, 393 So.2d 1069, 1072 (Fla.1980). This view is consistent with the first requirement of section 90.702, that the opinion evidence be helpful to the trier of fact, as well as the provisions of section 90.403, that the danger of prejudice may outweigh the value of the evidence.

483 So.2d at 1385.

In an effort to ensure a degree of reliability of such evidence, the court went on to:

3. 90.702 Testimony by experts.—If scientific, technical, or other specialized knowledge will assist the trier of fact in understanding the evidence or in determining a fact in issue, a witness qualified as an expert by knowledge, skill, experience, training, or education may testify about it in the form of an opinion; however, the opinion is admissible only if it can be applied to evidence at trial.

In a recent case, *Correll v. State*, 523 So.2d 562 (Fla.1988), our supreme court was confronted with the question of admissibility of blood tests using the electrophoresis process, a method used to determine the presence of certain enzymes in the blood. The court, noting at the outset that such process *could hardly be characterized as novel* (a fact which distinguishes that case from the one before us), held the evidence to be admissible. We make note of this case, despite its factual differences, because the electrophoresis process is an important step in separating the DNA fragments.

5. *Downing* involved expert testimony on the accuracy of eyewitness identification offered by

reaffirm what we view to be a fundamental requirement that the party seeking to introduce expert testimony first establish that the subject can support an expert opinion with a reasonable degree of reliability. Expert testimony in areas that are not sufficiently developed to support an expert opinion can present the kind of danger that section 90.403 was designed to prevent. While there is no requirement to demonstrate general acceptance, we believe that, without some indicia of reliability, opinion evidence on a particular subject could hardly be helpful to a jury as required by section 90.702.

*Id.* at 1386.

This "relevancy approach" suggested by the First District in *Brown* and adopted by the Fourth District in *Kruse*,<sup>4</sup> has been referred to as the preferred approach and was substantially adopted by the federal Third Circuit in *United States v. Downing*, 753 F.2d 1224 (3d Cir.1985).<sup>5</sup> This approach recognizes relevancy as the linchpin of admissibility, while at the same time ensuring that only reliable scientific evidence will be admitted, and seems preferable to the "general acceptance" approach of *Frye* which is predicated on a "nose counting," *Downing*, 753 F.2d at 1238, and may result in the exclusion of reliable evi-

*the defendant.* At least one commentator has suggested that this may be a distinguishing factor and that "the additional threshold of acceptance in the scientific community as a joint requirement with a judicial determination of reliability seems warranted where the scientific evidence carrying so much weight with the trier of fact is admitted against the criminal defendant, as it usually is." Graham, *Handbook of Florida Evidence*, § 704.2, p. 552 (n. 18). Professor Graham suggests that because of the importance juries place on scientific tests, "the *Frye* test in its original general acceptance or preferably its liberalized substantial acceptance form, which serves to screen such tests to assure scientific reliability, should continue to be followed." *Id.* at § 704.2, p. 551. Conversely, Professor McCormick advocates admissibility based on logical relevancy and exclusion if probative value is substantially outweighed by prejudice, misleading the jury or consuming undue amounts of time. *McCormick on Evidence*, § 203 at p. 608 (3d ed. 1984).

be a fundamental principle seeking to support an expert degree of reliability in areas that are expected to support the kind of evidence that was designed to be no requirement for general acceptance, some indicia of reliability on a particular case be helpful to a court on 90.702.

"suggested by and adopted by the court,"<sup>4</sup> has been used as an approach and approved by the federal courts in *Downing*, 385 So.2d 841.<sup>5</sup> This approach is as the linchpin of the same time the scientific evidence seems to be preferred "nose" approach stated on a "nose" standard at 1238, and the need for reliable evidence.

The commentator has set a distinguishing threshold of general acceptance as a joint determination of where the scientific weight with the trier of fact in the criminal defendant's case, *Handbook of Forensic Science*, p. 552 (n. 18). Prohibited because of the imprecision of scientific tests, "the general acceptance or substantial acceptance of such tests to assure they continue to be followed." Conversely, Prohibited admissibility based on exclusion if probative value is outweighed by prejudice, consuming undue resources (*Minnick on Evidence*, p. 284).

dence. We believe this approach to be the one which should be followed in Florida.<sup>6</sup>

[1] In *Downing*, the Third Circuit, in applying a relevancy/reliability approach, declared that where, as here, a form of scientific expertise has no established "track record" in litigation, courts may look to a variety of factors that may bear on the reliability of the evidence. 753 F.2d at 1238. These include the novelty of the new technique, i.e., its relationship to more established modes of scientific analysis, the existence of a specialized literature dealing with the technique, the qualifications and professional stature of expert witnesses, and the nonjudicial uses to which the scientific technique are put. *Id.* at 1238-39, citing 3 J. Weinstein & M. Berger, *Weinstein's Evidence* § 702[03].

#### (B) THE TECHNIQUE AND TESTIMONY RELATING TO DNA PRINTING—

##### (1) Witnesses:

Several witnesses testified for the State concerning the test. Dr. David E. Housman, the holder of a bachelor's degree and a Ph.D in biology, of the Massachusetts Institute of Technology, is a professor of molecular genetics, which deals with the structure and function of the DNA molecule and has taught at several universities since 1973. He has engaged in DNA analysis for some eleven years. He has published approximately 120 papers on molecular genetics, most of which deal with DNA, and has served on advisory boards involving genetics for the National Institute of Health, the Heredity Disease Foundation, and the Tourette's Syndrome Foundation. Housman visited Lifecodes, Inc., the company which performed the instant test and examined the procedures of the company though he did not witness the instant test.

Allen Guista is a forensic scientist employed by Lifecodes, Inc. and performed the DNA print identification tests here. He holds a Bachelor of Science degree from Yale University and has published

several papers on genetics, one of which involved his own research on DNA analysis. He has performed the identification test about 200 times.

Dr. Michael Baird is the manager of forensic testing at Lifecodes. He received a doctorate in genetics from the University of Chicago in 1978. He worked as a research associate at both the University of Michigan and Columbia University in the field of blood diseases at the DNA level and joined Lifecodes at its inception in 1982. He has been the manager of forensic testing for the past year and one-half. He teaches graduate courses in DNA technology at New York Medical College and has published a number of articles on DNA testing.

##### (2) Scientific Principles:

Summarizing Dr. Housman's testimony, it appears that DNA print identification is predicated on several well accepted scientific principles. DNA, a molecule that carries the body's genetic information, is contained in every living organism in every cell which has a nucleus (nearly all the cells of the human body). The configuration of the DNA is different in every individual with the exception of identical twins. It is the same in all the particular person's cells, and its characteristics remain unchanged during the life of the individual. DNA is a very complicated molecule and to read the "information" contained therein one needs to perform certain chemical procedures. Dr. Housman stated that a procedure known as restriction fragment length polymorphism has been in existence for ten years and enables scientists to cut the strands at predetermined locations and compare the DNA structure of different individuals. The test involves treatment of the DNA molecule with an enzyme or reagent which recognizes differences in the sequences found in the DNA molecule. The discovery of the use of these reagents won Dr. Arber a Nobel Prize about ten years

6. The State correctly asserts that in this case the evidence would meet the Frye standard as well as the relevancy test. We have reviewed the authorities discussing the standards of admissi-

bility to determine which of these will apply in this District, pending a definitive interpretation by our supreme court.

ago and according to Dr. Housman, is generally accepted in the scientific community. Indeed, Dr. Housman testified that DNA sequencing and comparison testing has been done for about ten years, is considered reliable, is performed by a number of laboratories around the world and is generally accepted in the scientific community. He stated also that the test and information received therefrom are routinely used in such areas as the diagnosis, treatment and study of genetically inherited diseases.<sup>7</sup>

We briefly summarize the test as described by Doctors Housman and Baird. The strand of DNA is cut at very precise points using the reagents which in effect "read" the order of the elements and cut precisely at the sequence they recognize. The next step is to identify by length the DNA fragments. This is done through gel electrophoresis which separates the different sized fragments of DNA. In this procedure, the cut DNA is put in a cell matrix

7. In the work entitled *Scientific Evidence in Criminal Cases*, Third Ed. (1986), the authors, Professors Moenssens, Inbau and Starrs comment thusly on the reliability studies and courtroom use of DNA evidence:

c. Reliability Studies and Courtroom Use

Unlike many advances in forensic sciences, which are developed by experts who are actively engaged in case work, and immediately applied by them to forensic experimentation and use, the DNA probe studies on semen and blood came out of a research laboratory whose scientists did not initially desire to apply the techniques to actual forensic investigations as soon as a working postulate and hypothesis had been formulated. Instead, they chose to subject the novel technique (explained here at greater length than some of the other techniques precisely because no other literature on it is as yet in print) to extensive experimentation and verification. As part of this research process, they have also invited independent scientists to follow their protocols, put the new techniques through its paces, and arrive at an impartial scientific assessment of the claims made by Lifecodes—a process of verification that ideally should always be followed by forensic scientists, but almost never is. The proponents of the techniques contend that the DNA testing establishes identity in rape and similar cases to a higher degree of certainty and with greater reliability and consistency than any other testing method currently available to forensic science and in paternity cases will provide a significant improvement over any current sci-

composed of gel and a negative electric current applied. The DNA, which has a negative charge, runs toward the positive charge. The gel acts as a sieve in which the large fragments cannot move as fast as the smaller ones. Once the length of the DNA fragments is established, the DNA is transferred to a piece of nylon membrane. A radioactive probe is then added which identifies particular fragments that it is designed to recognize. The membrane is put next to X-ray film and the film is exposed by the radioactivity. The film is developed and the results reveal bands of DNA. Such bands or more accurately the pattern of such bands can then be compared to those obtained in tests of other specimens.<sup>8</sup>

(C) PROCEDURES IN THIS CASE:

The test here was performed by Lifecodes, Inc., a licensed clinical laboratory in the State of New York. The testimony

entific test in establishing biological parentage and accurately identifying a child of innocent alleged parenthood. Their research to date appears to validate these claims. However, independent research is still going on to determine if the claims can be supported. As this chapter is being written, there are, as yet, no court decisions involving the use of DNA testing for the simple reason that its developers have refrained from seeking its evidentiary use until all testing is completed. With the body of knowledge and verification that is currently available, the test results undoubtedly could meet a standard of "verifiable certainty." Possibly, since the underlying genetic research has been done for several decades by the most prominent geneticists and immunologists, the test results could meet the "general acceptance test" of the venerable *Frye* decision. Because the developers of the probes and test protocols have not, as of this writing, chosen to offer the test as an evidentiary tool, no appellate courts have had the opportunity to decide the issue of admissibility. Without a doubt, if the independent verification that is expected to be well advanced even as this book is published confirms the claims of the originators, courts will leap to embrace the new technique as yet another source for scientific evidence of identity. [Footnote omitted].

*Id.* at 358-359.

8. For a more detailed description of the test, see Moenssens, et al., *Scientific Evidence in Criminal Cases*, Third Ed. (1986), pp. 356-358.

revealed that Lifecodes was founded in 1982 as a research and development laboratory, specializing in DNA paternity and identity testing and began developing DNA probes. The company currently performs forensic and paternity testing as well as testing in diagnosing genetic-type diseases. The DNA test is essentially the same for all of these purposes, with the difference being in the probe that is used.

There was extensive testimony as to the precise methods used by Lifecodes in performing the instant test. Dr. Guisti testified about each step in the process and Dr. Housman, who reviewed Dr. Guisti's results testified that in his opinion the test was accurately and properly performed. There was also testimony that various controls were used in the testing process. For example, Dr. Baird testified that every reagent and enzyme purchased by Lifecodes is tested on known DNA samples. Similar tests are performed on the gel used in the electrophoresis process. Appellant contends that this test is unreliable, because the new gel is only tested to be certain that it works the way the old gel worked and that if the old gel worked improperly, that error would be carried over to the new batch. We find no merit in this contention. In addition to the foregoing tests, control samples containing known fragment sizes are loaded in the test to monitor the electrophoresis and assure an accurate result. The evidence reveals that if the gel is not properly prepared or if it is bad, the test will ordinarily not work rather than leading to an incorrect result. Indeed, if there were any voltage fluctuations or problem with the solutions ordinarily no result is received as opposed to an erroneous result. Use of control samples is also a check as they would also be affected by any error. The scientific testimony indicates acceptance of

9. Appellant argues that these witnesses, particularly Dr. Baird, possess a built-in bias because their reputations and careers are built on DNA comparison work. Several courts have questioned whether a leading proponent of a particular technique could fairly and impartially testify concerning admission of the technique. See, e.g., *People v. Kelly*, 17 Cal.3d 24, 130 Cal.Rptr. 144, 549 P.2d 1240 (1976); *People v. Tobey*, 401

the testing procedures. The probative value of the evidence is for the jury.

The radiographs of the victim's and appellant's blood and the vaginal smear were exhibited to the jury, the comparison was explained, and the radiographs were admitted into evidence. Dr. Baird concluded that to a reasonable degree of scientific certainty, appellant's DNA was present in the vaginal smear taken from the victim. The State's expert witnesses were skillfully and thoroughly cross-examined, but no expert witness testified for the defense.

#### (D) ADMISSIBILITY.

In applying the relevancy test, it seems clear that the DNA print results would be helpful to the jury. § 90.702, Fla.Stat. (1988). Each of the State's witnesses was accepted by the trial court as an eminently qualified expert in the field of molecular genetics.<sup>9</sup> The crucial question here is whether the probative value of the testimony and test is substantially outweighed by its potential prejudicial effect. In this regard, the indicia of reliability referred to in *Kruse* come into play.

As noted in *Downing*, under the relevancy approach where a form of scientific expertise has no established "track record" in litigation, courts may look to other factors which bear on the reliability of the evidence. 753 F.2d at 1238. One of these is the novelty of the technique, i.e., its relationship to more established modes of scientific analysis. DNA testing has been utilized for approximately ten years and is indicated by the evidence to be a reliable, well established procedure, performed in a number of laboratories around the world. Further, it has been used in the diagnosis, treatment and study of genetically inherited diseases. This extensive nonjudicial use of the test is evidence tending to show the

Mich. 141, 257 N.W.2d 537 (1977) (both cases involving voiceprints). Neither *Frye* nor our evidence code require impartiality. See *Gianelli*, *supra* at 1216. Further, the point would not appear substantial here given that unlike voiceprints, DNA comparison work has a number of uses in fields other than forensic medicine such as diagnosis and treatment of disease.

description of the test, see *Evidence in Criminal Law*, pp. 356-358.

reliability of the technique. *Downing*, 753 F.2d at 1239.

Another factor is the existence of specialized literature dealing with the technique. The record reveals that a great many scientific works exist regarding DNA identification. According to Dr. Baird, Lifecodes maintains a file on all scientific journal articles and publications with regard to DNA testing and he was unaware of any that argue against the test's reliability.<sup>10</sup>

A further component of reliability is the frequency with which a technique leads to erroneous results. *Downing*, 753 F.2d at 1239. The court there noted:

At one extreme, a technique that yields correct results less often than it yields erroneous one[s] is so unreliable that it is bound to be unhelpful to a finder of fact. Conversely, a very low rate of error strongly indicates a high degree of reliability. In addition to the rate of error, the court might examine the type of error generated by a technique.

*Id.*

The testimony here was that if there was something wrong with the process, it would ordinarily lead to no result being obtained rather than an erroneous result. Further control samples are employed throughout the process which permits errors, if any, to be discovered. These factors are further indicia of reliability. See *United States v. Williams*, 583 F.2d 1194 (2d Cir.1978) (court, in upholding admission of voiceprint evidence, emphasized that any shortcomings in scientific technique would result in inability to match two voice spectrograms rather than erroneous conclusion that the two spectra were generated by the same voice).

The frequency by which given DNA bands appear in the population is calculated

by using an established statistical data base, employing a statistical formula known as the Hardy-Weinberg equilibria. This principle is used for determining other genetic characteristics such as blood type or Rh factors, dates back to the 1920's and has been generally accepted in the scientific community as being accurate for this calculation. Appellant contends that the data base of 710 samples is too small to be statistically significant. The only evidence in the case supports the statistical value of the randomly selected samples. The testimony reveals that as the data base expands, the probability numbers do not change statistically, and that The American Association of Blood Banks, in its book entitled *Probability of Inclusion in Paternity Testing* (1982) concludes that a data base of two to five hundred samples was found to provide adequate statistical results. Admittedly, the scientific evidence here, unlike that presented with fingerprint, footprint or bite mark evidence, is highly technical, incapable of observation and requires the jury to either accept or reject the scientist's conclusion that it can be done. While this factor requires courts to proceed with special caution, cf. *United States v. Ferri*, 778 F.2d 985 (3d Cir.1985) (expert testimony as to footprint evidence, unlike other scientific evidence is susceptible to examination by jury which factor limited potential prejudice), it does not of itself render the evidence unreliable.

[2] The trial court did not abuse its discretion in ruling the test results admissible in this case. In contrast to evidence derived from hypnosis, truth serum and polygraph, evidence derived from DNA print identification appears based on proven scientific principles. Indeed, there was testimony that such evidence has been used to exonerate those suspected of criminal

10. While no appellate court in this country has yet passed on the admissibility of DNA print identification in criminal cases, such evidence has been admitted in civil actions. *In the Matter of the Adoption of Baby Girl S*, 140 Misc.2d 299, 532 N.Y.S.2d 634 (N.Y.Surr.Ct.1988), (holding DNA evidence admissible in paternity action and noting that New York state trial court had recently authorized a DNA comparison test in criminal prosecution), and is admitted at trials

in England. See *Cobey v. State*, 73 Md.App. 233, 533 A.2d 944, 950, n. 1 (1987). Further, at least one jurist, concurring in part and dissenting in part in a capital case wondered why the State had not done a DNA test which he said would have made the question of guilt or innocence far less murky. *State v. Apanovich*, 33 Ohio St.3d 19, 514 N.E.2d 394, 406 (1987) (Brown, J., concurring in part, dissenting in part).

## STATE v. BOWEN

Fla. 851

Cite as 533 So.2d 851 (Fla.App. 5 Dist. 1988)

activity. Given the evidence in this case that the test was administered in conformity with accepted scientific procedures so as to ensure to the greatest degree possible a reliable result, appellant has failed to show error on this point.

[3,4] We find no merit in appellant's remaining points on appeal. The objected to comment by the prosecutor was in response to appellant's argument that there was an innocent explanation for appellant's fingerprints found on the window screen. The prosecutor commented in response that no evidence had been presented which provided an innocent explanation. Appellant's reliance on *Carawan v. State*, 515 So.2d 161 (Fla.1987) for the proposition that he could not be convicted on both the aggravated battery and the sexual battery charges is misplaced. *Carawan* specifically applied only to separate punishments arising from one act, not one transaction. The charges of aggravated battery and sexual battery arose from discrete acts committed during one transaction and separate convictions and punishment are appropriate here. See *Arnold v. State*, 514 So.2d 419 (Fla. 2d DCA 1987).

Finding no error, the convictions and sentences are

AFFIRMED.

DAUKSCH and DANIEL, JJ.,  
concur.



Tommie Lee ANDREWS, Appellant,

v.

STATE of Florida, Appellee.

No. 88-320.

District Court of Appeal of Florida,  
Fifth District.

Nov. 10, 1988.

Appeal from the Circuit Court for Orange County; Rom W. Powell, Judge.

James B. Gibson, Public Defender and Kenneth Wits, Asst. Public Defender, Daytona Beach, for appellant.

Robert A. Butterworth, Atty. Gen., Tallahassee and Kellie A. Nielan, Asst. Atty. Gen., Daytona Beach, for appellee.

ORFINGER, Judge.

Affirmed on the authority of *Andrews v. State*, 533 So.2d 841 (Fla. 5th DCA 1988). We write simply to note that in addition to the DNA identification evidence, the victim here identified appellant both at a photo line-up and at trial as the perpetrator.

AFFIRMED.

DAUKSCH and DANIEL, JJ.,  
concur.



STATE of Florida, Appellant,

v.

Carol BOWEN, Appellee.

No. 88-544.

District Court of Appeal of Florida,  
Fifth District.

Oct. 20, 1988.

Defendant was convicted in the Circuit Court, Brevard County, John Dean Moxley, J., of DUI manslaughter, and State appealed sentence imposed. The District Court of Appeal, Orfinger, J., held that trial court improperly retroactively applied amended DUI statute as reason for downward departure sentence.

Vacated and remanded.

d statistical data  
statistical formula  
einberg equilibria.  
determining other  
ch as blood type  
to the 1920's and  
ted in the scien-  
accurate for this  
ontends that the  
is too small to be  
The only evidence  
tatistical value of  
mples. The testie  
data base ex-  
numbers do not  
at The American  
nks, in its book  
clusion in Pater-  
udes that a data  
red samples was  
ate statistical re-  
cientific evidence  
ted with finger-  
mark evidence, is  
ic of observation  
either accept or  
lusion that it can  
or require courts  
ution, cf. *United*  
985 (3d Cir.1985)  
otprint evidence,  
lence is suscepti-  
ry which factor  
), it does not of  
e unreliable.

id not abuse its  
t results admissi-  
trast to evidence  
truth serum and  
ived from DNA  
s based on prov-  
ndeed, there was  
ice has been used  
acted of criminal

ate, 73 Md.App. 233,  
7). Further, at least  
rt and dissenting in  
dered why the State  
hich he said would  
guilt or innocence  
panovitch, 33 Ohio  
6 (1987) (Brown, J.,  
ing in part).

Original sponsors: Jones, Rodey,  
Faiks, et al.

ADDITIONS

DELETIONS

1 IN THE SENATE BY THE JUDICIARY COMMITTEE  
2 CS FOR SENATE BILL NO. 275 (Judiciary)  
3 IN THE LEGISLATURE OF THE STATE OF ALASKA  
4 SIXTEENTH LEGISLATURE - FIRST SESSION

5 A BILL

6 For an Act entitled: "An Act concerning the admissibility into evidence of  
7 deoxyribonucleic acid (DNA) print tests in civil and  
8 criminal proceedings; and providing for an effective  
9 date."

10 BE IT ENACTED BY THE LEGISLATURE OF THE STATE OF ALASKA:

11 \* Section 1. FACTUAL BASIS AND FINDINGS. (a) Recent developments in  
12 molecular biology and genetics have established scientific principles that,  
13 when applied forensically, can determine the identity of any person.  
14 Deoxyribonucleic acid (DNA) is an organic substance found primarily in the  
15 chromosomes that are structures within the nuclei of cells. DNA finger-  
16 printing, often called genetic fingerprinting, is a forensic technique that  
17 relies on the unique sequence of genetic building blocks that make up human  
18 chromosomes. DNA fingerprinting permits the personal identification of an  
19 individual by comparing, in extracted samples, the repetitive patterns of  
20 the DNA in the chromosomes. The sample taken produces a print that an  
21 expert can read to identify sequential patterns of the four basic compo-  
22 nents of DNA. The sequential pattern of the DNA, unique to each indi-  
23 vidual, permits identification with a high degree of certainty. Depending  
24 on the number of probes and the specific test that is used, DNA finger-  
25 printing permits exceptionally precise personal identification.

26 (b) Personal identification has always been of vital concern to  
27 enforcement of criminal law and completion of some civil proceedings.  
28 Developed only in the past six years, DNA fingerprinting has already come  
29 to play a significant role in civil actions, chiefly to confirm or refute

1 paternity, and in criminal prosecutions. The technique provides investiga-  
2 tors and litigators with powerful evidentiary tools to help resolve diffi-  
3 cult cases. Research recently conducted for the Alaska State Legislature  
4 affirms that approximately 30 states have used the DNA fingerprinting  
5 process in conjunction with criminal prosecutions. In many of the states,  
6 trial courts have initiated action on a case-by-case basis to admit DNA  
7 fingerprint evidence. In most cases, the trial court judge has determined  
8 that the evidence is admissible, finding that the procedure has gained  
9 acceptance within the scientific community and that proper testing proce-  
10 dures had been followed.

11 (c) The legislature, believing that it is necessary to resolve the  
12 policy question relating to the admissibility of evidence developed by the  
13 DNA fingerprinting technique without unnecessary litigation, finds that

14 (1) the scientific methods of identifying unique DNA patterns or  
15 structures in human chromosomes have been refined to a level of accuracy  
16 that approaches an imperceptible margin of error;

17 (2) when conducted by trained personnel in a manner that is  
18 consistent with standard methods and techniques, the results of DNA finger-  
19 printing tests are recognized in the scientific community as accurate and  
20 reliable;

21 (3) because of the high degree of accuracy that attends DNA  
22 print testing, DNA fingerprint evidence has probative value that outweighs  
23 the danger of unfair prejudice of that evidence;

24 (4) DNA fingerprint evidence should be admitted into evidence in  
25 civil actions and criminal proceedings in the courts of the state.

26 \* Sec. 2. AS 09.25 is amended by adding a new section to read:

27 Sec. 09.25.300. ADMISSIBILITY OF DNA PRINT TESTS. (a) The  
28 results of a deoxyribonucleic acid (DNA) print test are admissible  
29 into evidence in a trial or hearing in a civil action. There is a

1 presumption that the DNA print test results are valid and further  
2 foundation for their introduction as evidence is unnecessary if it is  
3 established at the trial or hearing that the DNA print test was per-  
4 formed according to methods approved by the Department of Public  
5 Safety by a person who has been trained according to techniques,  
6 methods, and standards of training approved by the Department of  
7 Public Safety. *[and whose training was certified]*

8 (b) Statistical population frequency evidence based on a DNA  
9 print test result is admissible into evidence in a trial or hearing in  
10 a civil action to demonstrate that an individual is the source of a  
11 specific human sample of blood, semen, urine, tissue, or other DNA-  
12 bearing cells.

13 (c) In this section,

14 (1) "deoxyribonucleic acid" or "DNA" means molecules con-  
15 taining genetic information that are found in chromosomes;

16 (2) "deoxyribonucleic acid print test" or "DNA print test"  
17 means the genetic identification process through which DNA material in  
18 a human sample of blood, semen, tissue, or other DNA-bearing cells is  
19 analyzed and compared with another human sample of DNA-bearing cells  
20 for identification purposes.

21 \* Sec. 3. AS 12.45 is amended by adding a new section to read:

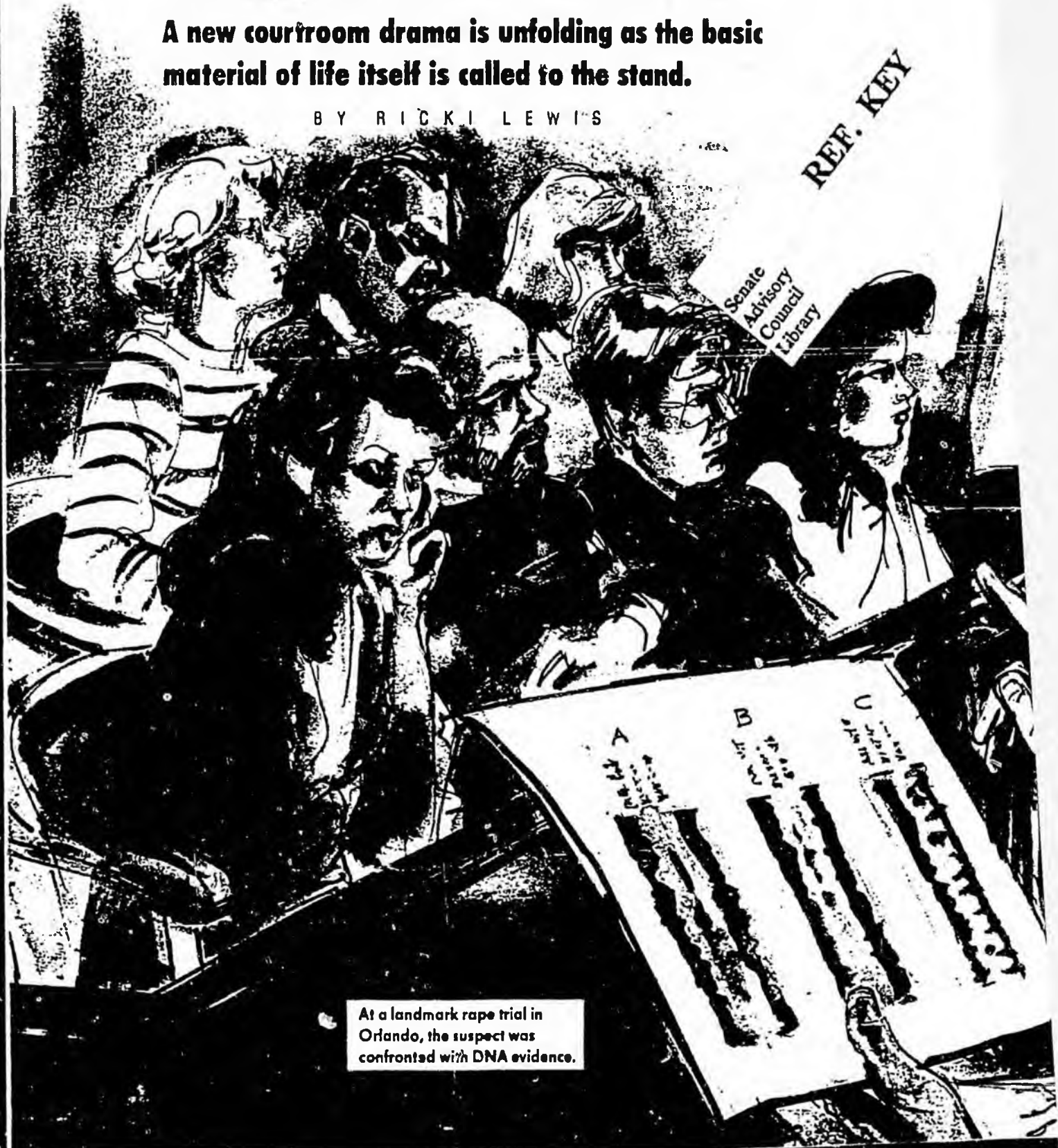
22 Sec. 12.45.035. ADMISSIBILITY OF DNA PRINT TESTS. The provi-  
23 sions of AS 09.25.300 apply in a criminal action or proceeding.

24 \* Sec. 4. This Act takes effect immediately under AS 01.10.070(c).

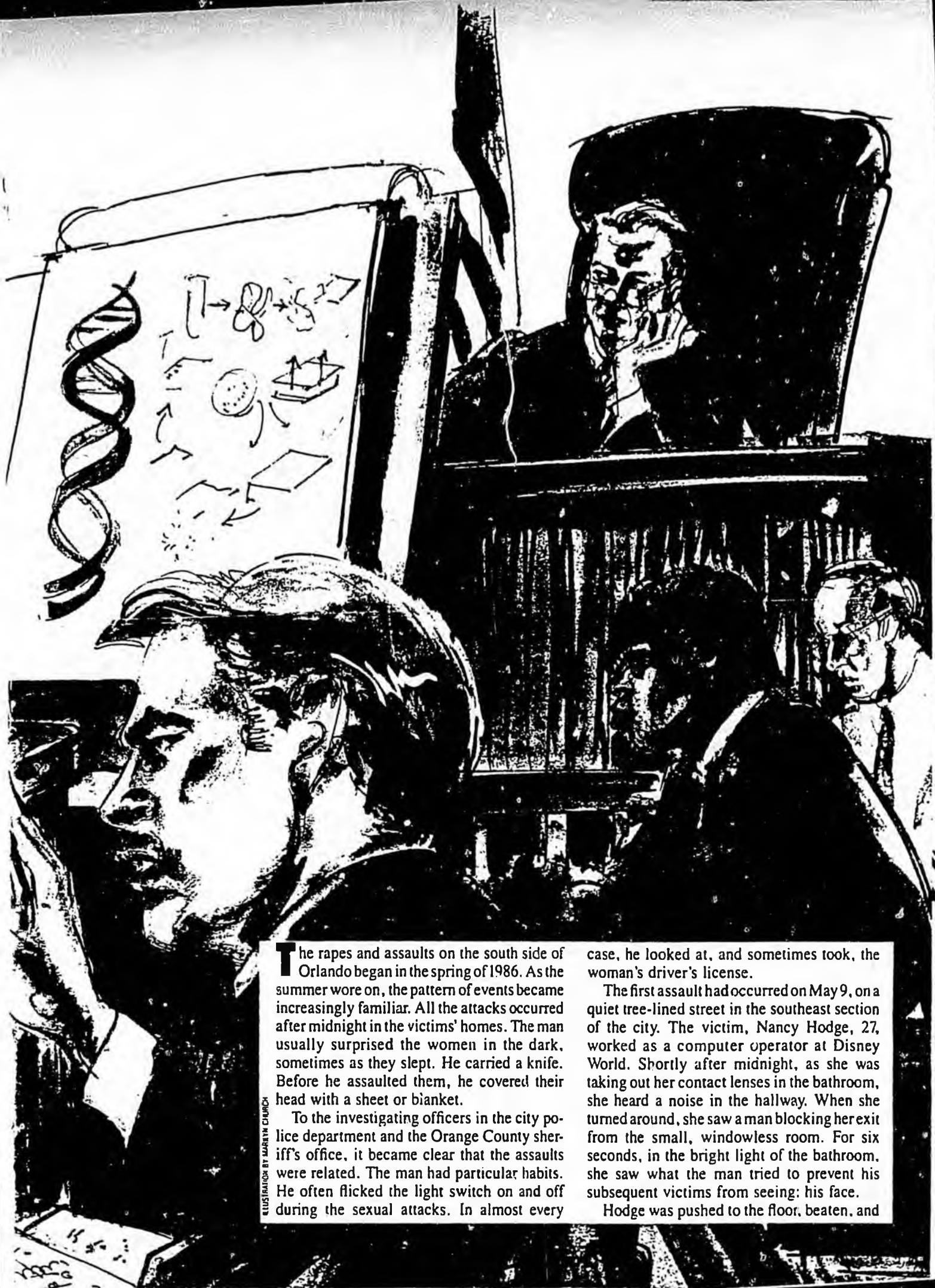
# DNA FINGERPRINTS WITNESS FOR THE PROSECUTION

**A new courtroom drama is unfolding as the basic material of life itself is called to the stand.**

BY RICKI LEWIS



At a landmark rape trial in Orlando, the suspect was confronted with DNA evidence.



**T**he rapes and assaults on the south side of Orlando began in the spring of 1986. As the summer wore on, the pattern of events became increasingly familiar. All the attacks occurred after midnight in the victims' homes. The man usually surprised the women in the dark, sometimes as they slept. He carried a knife. Before he assaulted them, he covered their head with a sheet or blanket.

ILLUSTRATION BY MARTIN CHURCH

To the investigating officers in the city police department and the Orange County sheriff's office, it became clear that the assaults were related. The man had particular habits. He often flicked the light switch on and off during the sexual attacks. In almost every

case, he looked at, and sometimes took, the woman's driver's license.

The first assault had occurred on May 9, on a quiet tree-lined street in the southeast section of the city. The victim, Nancy Hodge, 27, worked as a computer operator at Disney World. Shortly after midnight, as she was taking out her contact lenses in the bathroom, she heard a noise in the hallway. When she turned around, she saw a man blocking her exit from the small, windowless room. For six seconds, in the bright light of the bathroom, she saw what the man tried to prevent his subsequent victims from seeing: his face.

Hodge was pushed to the floor, beaten, and



cut with a sharp instrument. Her face was covered with a sheet and she was raped three times. When he finished, he tried to wipe his semen from her body. He took her purse, which contained her driver's license and credit cards, and ordered her not to move. She heard him walking from room to room, as if he were checking the house to make sure that he had left behind no evidence. Then he slipped out as he had entered, through an unlocked door.

The man was careful, very careful. As more assaults occurred, the detectives on the case began to build a profile of a man who methodically chose his victims. He intimately knew the lives of the women he attacked. He stalked his victims for weeks beforehand, prowling around their houses, looking through their windows, learning when they would be alone. (In fact, six weeks before Hodge was raped, she had notified the police of a prowler around her house.) Before raping one woman, he told her, "I've seen what you do with your fat boyfriend. Now I want you to do the same with me."

The police had little to go on. A composite drawing of the man had been made, based on Hodge's descrip-

tion, but it hadn't led to any suspects. No fingerprints had been found at Hodge's house or at the houses of the other victims. But there was one piece of evidence that Hodge's rapist could not erase. A vaginal swab taken after the attack contained his semen. Many months later the evidence turned out to be critical.

**M**eanwhile, all through 1986, the rapes in Orlando continued. The police suspected that the same man was responsible for some 23 incidents of prowling, breaking into women's homes, and attempted assaults or rapes. On February 22, 1987, he struck again. A 27-year-old woman was assaulted in the early morning hours while her two young children slept

in the room next door. A sleeping bag was wrapped around her head, and she was beaten, cut, and raped repeatedly. But this time the man was less careful. The police found two fingerprints on the window screen that he had removed to enter the house. A vaginal swab was taken from the victim to collect a semen sample.

By early 1987, officers from the city's tactical patrol force had been assigned to the case. Plainclothesmen staked out the neighborhoods where the rapist was most likely to strike and patrolled the streets in unmarked cars. On March 1 their surveillance paid off. At 2:48 A.M. a woman called the police to report a prowler on Candlewick Street in the southeast section of the city. A responding patrol car saw a blue 1979 Ford Grenada speeding away from the area. The officer followed the car for two miles before the suspect sped

around a sharp corner and crashed into a utility pole.

The driver's name was Tommie Lee Andrews. He was 24 and worked at a local pharmaceutical warehouse. He lived about three miles from Hodge's house.

The following morning, at Orlando Police Department headquarters, Hodge was asked to examine a photo lineup. She immediately identified Andrews as her assailant. He was charged with sexual battery, aggravated battery, and armed burglary. He was also charged with the rape of the young mother attacked in February, just one week before his arrest.

The prosecutor handling the cases was Tim Berry, 43, assistant state attorney for Orange County. Berry, a burly, sandy-haired ex-sheriff, had prosecuted serial rape trials before. But he was having a hard time building an ironclad case against Andrews. The assailant was so damned fastidious in shielding his victims' eyes! Even Hodge's six-second view, although it seemed an eternity to her, might not be enough to convince a jury. Standard forensic tests comparing the suspect's blood with the semen found on the victim could only suggest that Andrews *might* have committed the crime. (The results fit Andrews, but they also fit 30 percent of the U.S. male population.) Berry wished that he could come up with something else.

One afternoon in early August Berry was visited by Jeffrey Ashton, another attorney in his office, who told him of a TV news report he'd seen about a new technique called DNA fingerprinting. It had been used in a rape-murder case in Britain. More than 1,000 men living in three villages near Leicester had



The most dramatic evidence in the Orlando trial was these autoradiographs. They clearly show that the DNA patterns (highlighted areas) in the suspect's blood matched those in the semen found on the rape victim.

## Other tests can exclude a man or suggest he's guilty. This one can positively nail him.

had their DNA tested in the search for the guilty man. The test had cleared one man under suspicion and led to the arrest of another, who subsequently confessed.

Ashton was referring to the much publicized case of Colin Pitchfork, a 27-year-old baker and family man who was found guilty of raping and strangling two 15-year-old girls in the Leicestershire countryside. The DNA fingerprinting test used in Britain was developed by Alec Jeffreys, a geneticist at the University of Leicester. Jeffreys got the idea for the test while looking for genetic variations to serve as markers for inherited disease. It struck him that the techniques molecular biologists use to visualize variations in DNA could also be used to establish identity. His test was quickly seized on for forensics and paternity testing. When it was used to compare the DNA patterns in Pitchfork's blood with those in the semen found on the two strangled girls, it clearly showed a match.

Ashton had been intrigued by the British case and filed it in the back of his mind. Then, in the summer of 1987, he saw an advertisement in a U.S. law publication for Lifecodes, a new DNA testing service. Berry and he called Michael Baird, Lifecodes' director of forensic and paternity testing, who agreed to analyze the evidence in the Andrews rape cases.

In August the evidence was flown from Florida to the Lifecodes laboratory in Valhalla, New York. Meanwhile, with less than two months to go to trial, Berry began a crash course in genetics. He realized he was embarking on new territory. DNA analysis had never been used in a rape trial in the

United States. To familiarize himself with the new technology, Berry called on David Housman, a molecular biologist at MIT whom he planned to use at the trial as an expert witness. In late summer Berry and Hal Uhrig, one of the lawyers for Andrews, met with Housman and Baird for an intensive three-hour session on genetics.

**D**NA, or deoxyribonucleic acid, our genetic blueprint, is a three-foot-long chemical tightly wound inside virtually every cell of the body. It's packaged into 46 chromosomes—23 contributed by the father's sperm, 23 contributed by the mother's egg. "Every cell derived from that fertilized egg will have the same DNA," explains Housman. That's one of the keys to DNA testing. "It can be done on basically any type of cell—cells in blood samples, semen samples, hair samples, skin scrapings from under a suspect's fingernail. All of the cells will bear a unique imprint."

DNA looks like a sleek double-stranded spiral—the double helix. Its two strands are made up of four chemical building blocks—adenine (A), cytosine (C), guanine (G), and thymine (T)—that are strung together in unfathomable permutations, like AACTTCCTTATG TGTTTGGTATTTGGGGT TTATTTGGGTTCCCCT.

The two strands are held together by pairings of these building blocks—somewhat like the two sides of a ladder are held together by its rungs. A simple rule determines how the building blocks pair up: A invariably joins with T, C always joins with G. Be-

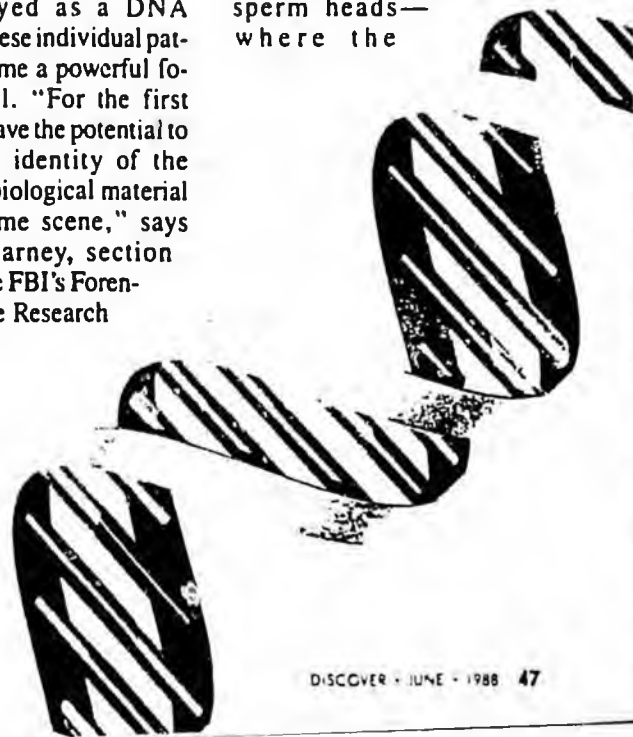
cause of this neat arrangement, the sequence of building blocks on one strand is faithfully complemented by the sequence of building blocks on the other strand. These incredibly long sequences of DNA contain an awesome amount of information. They spell out all the instructions needed for making a human being.

Long stretches of this DNA, not surprisingly, remain the same from person to person—we all have a head, a heart, legs, arms, and soon. But certain areas of the DNA vary dramatically from one individual to another. In these areas, short sequences of "junk DNA," whose function is not clearly understood, repeat themselves over and over again, like a kind of stutter. It's these highly variable, or polymorphic, regions that allow us to establish identity, explains Baird. Because of them, the DNA from no two people (with the exception of identical twins) breaks down into precisely the same pattern.

Displayed as a DNA "print," these individual patterns become a powerful forensic tool. "For the first time, we have the potential to prove the identity of the source of biological material at the crime scene," says James Kearney, section chief of the FBI's Forensic Science Research

and Training Center in Quantico, Virginia. Biochemical forensic techniques traditionally used are not nearly as specific. These tests rely on the fact that certain blood-group substances and protein markers are found in both blood and semen. Crime lab serologists can therefore compare semen samples found on the victim or her clothing with samples of the suspect's blood and look for matching patterns. But serologists can only narrow down the number of people with a particular combination of markers to a certain percentage of the population. They can exclude a falsely accused man or suggest that a suspect could be guilty with a certain probability—but they cannot positively nail him.

On August 11 Baird and Alan Giusti, a Lifecodes forensic scientist, analyzed the vaginal swab collected within an hour of Hodge's rape and the blood samples from Hodge and from the suspect. First Giusti determined that the semen on the swab could provide enough DNA. (The test requires about 300,000 intact sperm heads—where the





## THE MAKING OF A DNA PRINT

Each person's DNA has individual patterns. Displayed as a "print," these patterns are a powerful forensic tool. In the Orlando case, DNA extracted from the suspect's blood was compared with DNA isolated from the evidence—a sample of the rapist's semen. A blood sample (1) was collected from the suspect. White blood cells containing DNA were extracted and burst open (2), releasing the DNA strands (3). The strands were snipped into fragments (4), using scissorslike restriction enzymes. Electrophoresis was used to align the DNA pieces by size—longest pieces at one end, shortest pieces at the other—in a groove on a sheet of gel (5).

DNA is tightly packed—out of an average of 400 million to 500 million sperm per ejaculate). The cotton end of the swab was soaked in detergent to wash off the sperm and selectively destroy the vaginal cells. Next the sperm heads were chemically burst open to release the tangled strands of DNA. A solvent was used to isolate the DNA from the cell membranes and other cellular debris.

Giusti then turned his attention to the blood samples. The large, blobby white cells that contain the DNA were

separated from the blood samples by spinning them in a centrifuge. Then these cells were burst open and their DNA isolated.

The different samples of DNA (from the suspect's blood, the victim's blood, and the rapist's semen) were cut apart with restriction enzymes. These "molecular scissors" snip strands of DNA wherever they recognize a specific sequence of building blocks (for example, the restriction enzyme Pst I always cuts at the sequence CTGCAG). For the

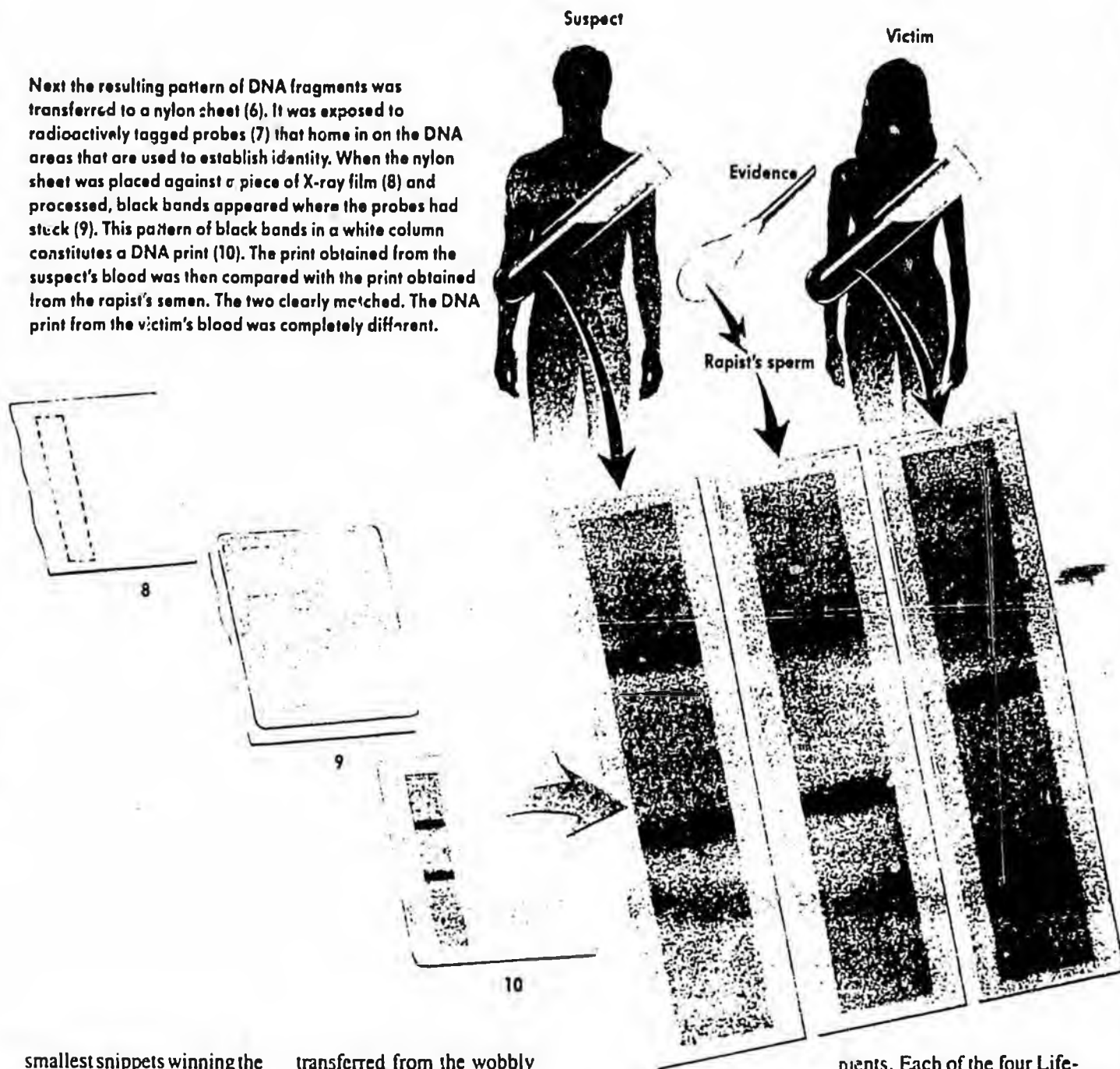
most part, a restriction enzyme will cut everyone's DNA in the same places, and therefore into same-size fragment lengths. But in every person's DNA, units of repetitive "junk DNA" periodically turn up; in those areas the cut points get shifted, and as a result, the fragment lengths vary. These highly individual fragment patterns can then be visualized on film and compared.

At this stage, though, the fragments from the three samples Giusti was analyzing were a mishmash. Before

a comparison could be made, they had to be arranged by size. This was done with one of molecular biology's most common tools, gel electrophoresis. The cut DNA was placed in a groove at one end of a sheet of a gelatinous substance called agarose. An electric current was then used to drive the pieces across the gel.

This is how the process works: DNA carries a negative charge, and a positive electric pole is placed at the far end of the gel sheet. The DNA pieces head for it, the

Next the resulting pattern of DNA fragments was transferred to a nylon sheet (6). It was exposed to radioactively tagged probes (7) that home in on the DNA areas that are used to establish identity. When the nylon sheet was placed against a piece of X-ray film (8) and processed, black bands appeared where the probes had stuck (9). This pattern of black bands in a white column constitutes a DNA print (10). The print obtained from the suspect's blood was then compared with the print obtained from the rapist's semen. The two clearly matched. The DNA print from the victim's blood was completely different.



smallest snippets winning the race, the larger, heavier ones mired closer to the starting line. By the end of the race the fragments are neatly separated by size, but they cannot be seen—somewhat like conventional fingerprints before they are dusted.

Giusti next used a chemical to split apart the double-stranded DNA fragments. The process "unzips" each fragment into two strands, leaving their chemical bases A, C, G, and T exposed like teeth on an open zipper. The fragment pattern was then

transferred from the wobbly gel to a stiffer nylon sheet.

The next step was to zero in on the parts of the DNA pattern that are unique to each individual. To do this, Giusti exposed the nylon sheet to a series of four "probes" that had each been labeled with a radioactive tag. These probes are actually short sequences of lab-made DNA that stick wherever they find their complementary sequences on the DNA strands. (Since A binds to T, and C to G, a probe with the sequence ATCGTA would bind to the sequence

TAGCAT. Or, to continue the zipper analogy, when a probe finds its matching piece of DNA, the two pieces "zip" together.)

The stage was now set for developing the DNA print. The nylon sheet was placed against a piece of X-ray film and exposed for several days. When the film was processed, black bands appeared where the radioactive probes had stuck to the frag-

ments. Each of the four Life-codes probes produces an average of two dark bands in an off-white column. Since fragment patterns vary from person to person, the bands appear in different positions in the columns, looking something like bar codes on cereal boxes. This band pattern is the DNA print, and each person's is as individual as the prints on his fingers.

By early October the DNA prints from all three samples in the Hodge case were ready. When Baird compared them, the bar codes from Andrews's

**"We all felt like we were  
back in science class," recalled a  
63-year-old juror.**

blood matched, band for band, the bar codes from the sperm sample. (The bar codes from the victim's blood, on the other hand, looked completely different.) The evidence was even more compelling when he consulted Lifecodes' data base, which calculates how frequently a pattern could conceivably appear. The frequency of Andrews's pattern was one in 10 billion. "In a world population of just over five billion, he's the only guy who could have left his semen there," says Baird.

Berry had his evidence. On October 20, 1987, Andrews stood trial for the sexual assault on Hodge. But this was no ordinary rape trial. DNA fingerprinting was on the stand just as much as Andrews.

**W**hen a new scientific test is used as evidence in a trial, it must first meet the so-called Frye standard: the judge must be convinced that the technology involved is "sufficiently established to have gained general acceptance in the particular field in which it belongs." This usually requires a pretrial hearing, with no jury present, in which lawyers from both sides argue the reliability and reputation of the new technology, with the aid of expert scientific witnesses. Such a hearing took place on Monday, October 19. Housman, Berry's expert witness, told the judge that DNA fingerprinting is a familiar technique in genetic research. "We do it routinely, roughly five to ten times a day in my laboratory," said Housman, "and it's done on a similar basis in laboratories around the world." The judge ruled that the DNA evidence was admissible. On Tuesday the four-man, two-woman jury



DNA strands are unzipped (top) and exposed to lab-made DNA probes that stick where they find their matching sequence.

was selected, and on Wednesday morning the jurors began hearing the evidence.

Berry led the prosecution. When it was Housman's turn to testify, he repeated the basic genetics lesson he'd given at the pretrial hearing. A nervous Hodge took the stand and identified Andrews as the man who had attacked her 17 months earlier. Later, when Andrews testified, he denied ever leaving his apartment on the evening of May 9, 1986. It was a classic rape case, with the word of the

victim pitted against the word of the suspect.

Thursday's proceedings opened with Lifecodes' Giusti and Baird. Using charts to illustrate the DNA fingerprinting procedure, they walked the jury members through each stage of the test. Finally, on a light box, Baird displayed the X-ray photographs, or autoradiographs, of the DNA patterns. They clearly showed that the DNA from Andrews's blood sample matched the DNA of the

sperm found on the victim.

So far, everything had gone more or less Berry's way. Hodge was holding up well under pressure. The expert witnesses were doing fine. But when Berry asked Baird to explain to the jury the one-in-10-billion statistic that supported the DNA test results, the defense lawyers objected. Berry was caught off guard. He hadn't expected the defense to challenge him on the admissibility of the statistical evidence, and he didn't have a strong legal counterargument prepared. He decided to withdraw the figure. Later Berry felt that this was what hurt them. The jury was unable to reach a verdict, and the judge declared a mistrial. Afterward Berry learned that one juror, an engineer, was quite forceful in his objections to accepting the technology.

It was a major blow to the prosecution and a bitter shock to Hodge. Until that point it had never even occurred to her that Andrews might not be convicted. For the first time it dawned on her that the man who had raped her, the man now sitting across the courtroom, might be given his freedom, and she thought both angered and frightened her. Above all, she was devastated that some jurors had apparently doubted her word. Her own testimony, she felt, had been somewhat upstaged by all the attention given to DNA. She had hoped that the trial would be the end of her ordeal. Now there would be a retrial.

Two weeks after the mistrial, on November 3, Andrews was in court again to stand trial for the rape he was accused of committing in February 1987. Berry, who was stricken with a bad case of the flu, watched his colleague Ashton lead the

prosecution. Drawing on research they had done between the two trials, the prosecutors were able to establish the legal precedence of using statistics to back up forensic test results. When DNA evidence was introduced at this trial, it had the added weight of the statistics. In addition, there were conventional fingerprints to bolster the case. On November 6 the jury returned a verdict of guilty. Andrews was sentenced to 22 years. He became the first man in the United States to be convicted of a crime with the help of DNA evidence.

**T**he retrial of Hodge's case began on Tuesday, February 2, 1988. On the witness stand Hodge was determined to convince this jury that there was no question she knew who her assailant was. She looked straight at Andrews and told the jurors, "There's no doubt that it's him." In his 20 minutes of testimony Andrews stuck to his story that he never left home the night of May 9, 1986. His girlfriend and her sister backed his alibi.

On Thursday DNA testing once again took center stage. Pointing to their charts and diagrams, Housman and Baird led the new group of jurors through the procedure. "We all felt like we were back in science class," a 63-year-old juror said afterward. Baird then presented the autoradiographs showing the DNA patterns found in the victim's blood, the suspect's blood, and the semen sample. Concentrating intently, the jury compared the DNA band patterns in one column with the band patterns in the next, figuring out the test results for themselves. "You didn't need a Ph.D. to see that the pattern in Andrews's blood

matched the pattern in the semen on the swab," Baird recalls.

When Berry asked Baird to tell the jury what percentage of the population would have this particular DNA pattern, Baird responded .00000001 percent. "In other words, one in ten billion people would have it," he explained.

The defense lawyers had not been able to find expert witnesses to challenge the test. But they attempted to question its reliability on the basis that not *all* of Andrews's DNA had been analyzed. "I tried to get across to the jury that we didn't need to look at the entire DNA molecule," recalls Baird. "We needed only to look at the *highly variable* regions. For example, if we tried to identify people by the number of arms, legs, and fingers they have, we wouldn't be able to differentiate between them easily. But if we looked at their eye color, hair color, whether or not their skin is freckled, we could distinguish them easily."

On Friday the six jurors met for 90 minutes. After a final review of the DNA prints, they returned to the packed courtroom and delivered the verdict: Andrews was guilty.

On Monday morning, in a courtroom jammed with reporters and TV camera crews, the judge handed down his sentence. Tommie Lee Andrews received concurrent terms of 78 years for sexual battery, 22 years for armed burglary, and 15 years for aggravated battery. Added to the 22-year sentence he'd received in the other rape trial, Andrews would serve 100 years.

For the DNA fingerprinting technique, however, the trial is far from over. Each



Geneticist Alec Jeffreys pioneered DNA fingerprinting, which was first used to solve a British rape case.

time a prosecutor chooses to use DNA evidence, he will have to repeat the process of convincing the judge of the technique's "general acceptance" in the scientific community. Only when it's been admitted in court many times will the pretrial hearings become unnecessary—and then only in the states where the hearings were held. The law is designed to protect defendants against a jury's being overly impressed by experts and scientific techniques before they've been shown to be truly reliable.

The acceptance process, however, is beginning. Since the Andrews verdict, seven rape and murder trials in the United States have resulted in convictions based on DNA fingerprinting. The evidence from at least another 100 criminal cases is being tested

with a view to going to court (In Britain DNA fingerprinting has resulted in convictions in eight criminal cases. But its main use there has been in immigration disputes, in which DNA testing is routinely called upon to resolve questions about blood-relatedness between family members.)

"I think it's going to revolutionize forensic biology in the same way that fingerprinting did in the early 1900s," says Michael Baird. His normally sober face lights up. "If you're a criminal, it's like leaving your name, address, and social security number at the scene of the crime. It's that precise." □

*Ricki Lewis, a biologist at the State University of New York at Albany, wrote about drugs from the sea in the May issue.*

# DNA Detectives

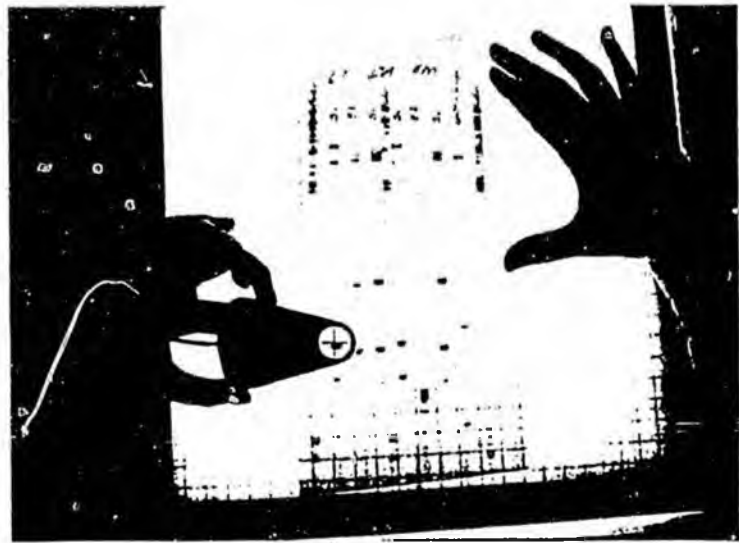
NOV 1 1987

Genetic 'fingerprinting' may herald  
a revolution in law enforcement.

11/6/87  
11/7

REF. KEY

Senate  
Advisory  
Council  
Library



ANDREW HOLBROOKE/BLACK STAR

A forensic scientist compares displays of the DNA codes for suspects in different rape cases.

By Stephen G. Michaud

**T**HERE WERE TWO things that the police in Pierce County, Wash., believed for a certainty last year about the rape suspect Alan J. Haynes: One, Haynes was guilty and two, they'd never be able to prove it. A 35-year-old bus driver for an adult day-care facility in a rural area south of Seattle, Haynes was accused of the sexual assault of one of his passengers. The 57-year-old victim was afflicted with Alzheimer's disease, which rendered her incapable of identifying her attacker, or testifying against him in court.

County Deputy Prosecutor Barbara Corey-Boulet had no witness to the crime, and no physical evidence except a semen sample recovered from the victim. A standard serological blood-type analysis of Haynes's blood and semen in-

Stephen G. Michaud writes frequently about forensic science.

dicated merely that he — as well as one-fifth of all the rest of the males in the state — might have committed the rape. "He was adamant that he didn't do it," says Corey-Boulet, "and we had no way to solve the crime."

No way, that is, until Corey-Boulet sent the tissue evidence to Lifecodes Corporation in Valhalla, N.Y. There, scientists subjected it to a state-of-the-art forensic technology commonly referred to as genetic fingerprinting. After a month of testing, Lifecodes reported that the semen sample could have come from only 1 in 3.5 million people — statistical proof that the sample belonged to Alan Haynes. So conclusive were the results that Haynes's attorney could find no expert willing to dispute them. His distressed client pleaded guilty as charged, and is now serving 10 years in the Washington state prison system.

Alan Haynes was positively linked to his crime by his DNA, deoxyribonucleic acid, the master molecule of life, which carries the complete human genetic code and is contained within virtually every human cell. Since last year, Haynes and a rapidly expanding number

of other violent criminals have been handed sentences as grave as the death penalty because researchers now can literally disassemble DNA, and examine it for microscopic variations that make human beings (except for identical twins) verifiably unique to a statistical certainty.

DNA testing's power to identify so specifically is a boon not only to the police but also to the wrongly accused, who now have an avenue of exoneration. This is a fact of compelling consequence in death-penalty cases where, if tissue samples survive from the crime in question, the chances of executing an innocent person may be dramatically reduced.

"We see it as probably the most significant thing for the century," says John W. Hicks, a deputy assistant director of the Federal Bureau of Investigation, which plans to open its own DNA identification laboratory this winter.

**D**NA TESTING REPRESENTS the first major breakthrough in forensic detection since Sir Edward Richard Henry figured how to use human fingerprints to identify criminals, at the turn of the century.

DNA probe analysis grew out of basic genetic research, with far different aims. A kind of serendipitous gift to police science, it takes advantage of a peculiarity within the human genetic code. Along the three feet of the double helix in each complete DNA molecule there exists, in addition to the tens of thousands of protein-coding genes, a so-far indecipherable wilderness called the intron. The intron, although it seems mostly chaotic, nevertheless contains certain repetitive sequences of the genetic alphabet, which geneticists sometimes call "stutters" or "burps."

To exploit these stutters for identification purposes, scientists use a technique that forms this genetic material into a distinctive pattern, similar to the universal bar codes on retail merchandise.

The degree of certainty that can be attained depends on a number of factors, one of which is the number of probes applied. A single probe might produce a pattern unique to one person in a hundred. The application of a second probe with the same discriminating power then produces a combined pattern unique to one person in ten

thousand. After several more probes, the final pattern might be unique to one person in a trillion, two hundred times as many people as exist on earth today. If this pattern matches the bar code for the suspect's DNA, the test has produced an identification every bit as reliable as a human fingerprint.

Almost any tissue sample is a potential candidate for testing. Bone, blood, semen, skin and hair (if it contains the root) all contain DNA, and are recovered from the scenes of violent crimes more often than are fingerprints. Noncellular body fluids such as saliva, urine and sweat can also carry testable quantities of DNA. This means that a discarded cigarette butt, shoes, a handkerchief, a wad of gum, or even the inner part of a hat or watchband could yield DNA evidence to solve a crime.

The potential for 100 percent certainty makes this a singular forensic tool. The best that other techniques, such as serology and hair analysis, can hope to establish is a 90 to 95 percent level of certainty leaving room for reasonable doubt, and acquittal.

"DNA has really opened up some valuable avenues," says Mac McLeod, Assistant State Attorney in Daytona Beach, Fla. He first used DNA evidence this spring in a successful murder prosecution, in which Randall Scott Jones was sentenced to the electric chair. "Before, with evidence like hair, your people could only come back and say, 'It's the same kind of hair.'" McLeod is currently awaiting DNA test results on hair specimens in another capital case. "It's going to be crucial," he says. "If it comes back positive, we're going to convict the guy of first-degree murder. If it comes back negative, we've got a long way to go."

**T**HE FIRST MURDER suspect to be identified and charged solely as a result of DNA analysis was a 27-year-old Briton named Colin Pitchfork, who, in September 1987, was charged with two murder-rapes near Leicester, England. His arrest culminated a four-year investigation. Pitchfork's DNA not only singled him out as a suspect but also cleared another young man who had confessed to the crimes.

The technique used to identify Colin Pitchfork was developed by a University of

Leicester ge. st, Alec J. Jeffreys, who gave it the trademark name DNA Fingerprinting. He has assigned the process in the United States to Cellmark Diagnostics, in Germantown, Md. Cellmark and Lifecodes (which uses a slightly different technology) operate the only two labs in the United States now conducting this kind of testing commercially.

Enthusiasm for the technique is building. Virginia, Florida and California are starting up their own DNA labs. California, anticipating the technology's advent, in 1985 passed a law mandating that all convicted sex offenders provide blood and saliva specimens at the time of their release from prison. According to Steve Helsley, chief of the California Attorney General's Bureau of Forensic Services, the more than 4,200 samples collected will be submitted for DNA testing, and will provide the basis for a computerized forensic DNA data bank to complement a computerized system the F.B.I. proposes to establish. The Colorado Legislature is considering a specimen-collection bill similar to the California statute. And in Seattle, where the Haynes case received wide publicity, such a county ordinance has already passed.

The first case in this country in which a conviction hinged almost exclusively on DNA testing occurred in early November of last year. An Orlando, Fla., judge sentenced the defendant, Tommie Lee Andrews, to 22 years in prison for rape. Last month, New York joined the number of states with a DNA conviction to its credit. In Queens, Victor Lopez, 46, the so-called "Forest Hills rapist," was convicted on an 18-count indictment. Although Queens Assistant District Attorney Robert Arena was able to put four of Lopez's alleged victims on the stand to identify him as their attacker, it was his presentation of the DNA evidence that ultimately swayed the jury. "That was the only thing that opened my eyes. That was the whole case, in my opinion," the jury forewoman Catherine Allen told a Newsday reporter.

DNA testing is not free of problems. The proprietary nature of the technique (the United States patent is pending) means that the F.B.I. and any regional forensic laboratory will have to pay fees to Lifecodes and Cell-

(Continued on Page 88)

# DNA

Continued from Page 73

mark. They now charge \$300 for every sample submitted, but when others, like the F.B.I., get into business for themselves and rely on the two companies as suppliers for probes, the costs may escalate. "That's the thing we're worried about," says James J. Kearney, head of the Bureau's Forensic Science Research and Training Center, part of the F.B.I. Academy complex at Quantico, Va. "It could cost quite a bit."

DNA testing can also detect genetic abnormalities, wholly separate from its power to discriminate among individuals for forensic purposes. This raises concerns among civil libertarians. The first commercial uses of this technology were in paternity cases, and Life-codes expects to profit much more handsomely from medical diagnostics than from forensic testing. Probes some day may be used to isolate defective genes, for instance, or in cancer diagnosis, raising the possibility of early gene therapy, in which a mutant or rogue gene's destructiveness might be mitigated or blocked. Some medical and legal experts foresee the possibility that an insurer or employer might run a DNA probe to check for information on susceptibility to genetic disease.

Prof. E. Donald Shapiro at New York Law School, co-author of "Law, Medicine, and Forensic Science," argues that its uses must be monitored. "It's like any sort of scientific technique," says Shapiro. "It should be limited to where the public has a vested interest, such as in crime." He would like to restrict medical applications of DNA analysis to diagnosis. He also suggests requiring that patients give their informed consent before the testing can be done. Since these records inevitably would be computerized, Shapiro favors making unauthorized access to them a felony.

**D**NA ANALYSIS CAN not be run on minute samples, a problem that is addressed by a complementary new technology called polymerase chain reaction (P.C.R.). Owned by the Cetus Corporation of Emeryville, Calif., and

licensed for police applications to Forensic Science Associates of nearby Richmond, P.C.R. solves the problem of what to do when there isn't enough tissue sample to run a DNA analysis. P.C.R. induces the material to replicate itself, much as it does naturally. It also offers the advantage of retrieving information from old or degraded tissue specimens. Archeologists have used P.C.R. to amplify trace amounts of DNA from a 40,000-year-old Siberian mammoth.

According to Dr. Ed Blake, a partner at Forensic Science Associates, his company has accepted at least 30 forensic P.C.R. cases. They include the hair analysis that McLeod, the Daytona Beach Assistant State Attorney, is waiting for. Of these examinations, the single one used in court, to date, was also part of Blake's most macabre case. Two Pennsylvania nursing-home owners, Helen and Walter Pestnikas, were indicted for negligent homicide in the alleged starvation death of one of their elderly patients, and with trying to cover up their crime by switching the victim's desiccated organs with those of another cadaver.

Blake and his team were able to determine that a part of one gene they isolated from the heavily damaged DNA of the exhumed organs occurred in only 10 percent of the population, enough to establish that the organs were those of the deceased. The P.C.R. results cleared the defendants of organ-switching, though the murder rap stuck. The results may only have succeeded in making the Pestnikases appear marginally less sinister, but their acceptance in court helped validate the technology as a new and useful forensic procedure.

**D**NA TESTING HAS proved to be particularly useful in conjunction with other forensic testimony. Last May, Randy D. Pioletti, a mortuary worker, was brought to trial in Wichita, Kans. Pioletti had been accused of the murder six months earlier of his estranged wife; the prosecutors, Ann Swegle and James Ward, charged that Pioletti then had partially incinerated his wife at the mortuary crematorium. The day after the murder,

'We see it as probably the most significant thing for the century,' says an assistant director of the F.B.I., which soon will open its own DNA lab.

Pioletti left a five-gallon bucket at the house of a friend; he said it contained rags. The police later found it to be half-full of broken and charred bones. A forensic pathologist determined that the remains were human, and a forensic anthropologist then described the bones as those of a woman of the approximate height and posture of the vanished Mrs. Pioletti. The pelvis revealed evidence of childbirth within the past five years; Mrs. Pioletti had borne a child during that period. A necklace identical to one of hers also was discovered in the bucket.

Other evidence placed the defendant in Mrs. Pioletti's company the night of her disappearance, and at the mortuary the following day. The forensic evidence almost certainly identified the remains as the victim's. What remained was to place her at the crematorium. This was made possible by means of a DNA test, performed by Lifecodes, on a blood sample fortuitously found on the side of the oven. Randy Pioletti continued to deny his culpability, but the jury convicted him of first-degree homicide and aggravated kidnap.

Needless to say, DNA testing has proved a nightmare for defense attorneys with guilty clients. "If they print your guy with this stuff you're dead," says Mac McLeod. "You can't combat it. There is no defense to it."

So far, no appeal has successfully challenged the legality or constitutionality of DNA forensic testing, or the California law requiring sex offenders to submit tissue specimens as a condition of their release from prison. Most of the current legal excitement, on the contrary, is

over how fast and how far DNA can be exploited to catch criminals.

An insurmountable problem for defense attorneys has been the unwillingness of credible experts to question the basic scientific premise for DNA analysis. "It's a major part of all that we accept as true in all medical science," points out Dr. Carole Jenny, director of the Harborview Sexual Assault Center in Seattle.

This is why no new case law is likely to emerge from the first courtroom use of the technology. Kenneth Witts, the Florida public defender, has based his appeal for Tommie Lee Andrews, who was convicted of rape, on "the test as Lifecodes runs it, as opposed to the general reliability of DNA testing." He has done so, Witts says, because in the original trial, the defense failed to produce any witness who would say that DNA testing in and of itself isn't reliable. "Had they done that, I would have had much more to work with," he adds.

Still, there are lingering fears in the legal community that a premature rush by prosecutors to use DNA evidence might expose it to innovative legal attack, and perhaps permanently damage its credibility. Such concerns have led California Attorney General John K. Van de Kamp to urge his state prosecutors to hold off on the technology until its reliability has been further validated.

One possible defense strategy, says Professor Shapiro, would be based on the legal requirement governing the admissibility of scientific evidence. This rule flows from the 1923 Frye decision restricting the use of lie-detector results in court. It reads, in part, that a new technology must "have gained general acceptance in the particular field in which it belongs."

"I would attack," says Shapiro, "on the issue that it has not been given the broad validity checking in the community" that Frye mandates. He attributes this to the fact that the "technology is not really typical and open to all. It's proprietary," he says. "It's a money-making technology."

Oliver C. Schroeder, professor emeritus at the Case Western Reserve University of Cleveland School of Law, expects there ultimately will be a constitutional challenge to the new technology, although he doubts it has a chance to succeed. He ex-

(Continued on Page 104)

Frye Test

# DNA

Continued from Page 89

plaints, and Shapiro concurs, that issues such as protection against self-incrimination, unreasonable search and seizure and due process in the taking of suspects' tissue samples have all been raised on behalf of drunk drivers and drug traffickers, and that they have failed to move the Supreme Court. "A constitutional differentiation for DNA testing might be made," he concedes, particularly if it involves a needle for extracting blood.

Knowledgeable observers such as Schroeder worry more that DNA testing may not turn out to be consistently reliable. They question the quality of the work that regional labs will do. "The more sensitive the test, the greater the possibility it has been done improperly," he says. "You'll have people in the crime labs who are not qualified to do this DNA test. The problem is already there with other scientific evidence..."

"Also," Schroeder goes on, "heads of [police] crime labs [sometimes] tell me that they have been told to find a certain result. Now that's not strange, because the loyalty of the scientist is not to science there; it's to his job. If he wants to be loyal to science, he better get a job somewhere else."

DNA testing may be further limited by the need for well-preserved specimens. Moisture, heat and even daylight accelerate the natural process of DNA degradation in tissue samples. "I can guarantee you," the F.B.I.'s Kearney says, "that if I draw your blood, put it on a piece of cloth and keep it under relatively humid conditions at body temperature, within three days I'm not going to be able to do the DNA analysis on it." Ideally, Kearney explains, semen, blood and other body tissue or fluids from a crime scene should be quickly air-dried and then frozen away from light — often a practical impossibility in the real world of crime detection and investigation.

Many forensic experts caution against unreal expectations that DNA testing will have a dramatic impact on overall criminal conviction rates. Its chief use, they say, will be in solving sex crimes. But other felonies where a suspect is likely to leave his or her DNA behind include, according to the F.B.I.'s John

Hicks, extortion cases (where saliva might be left on a ransom note's envelope glue or behind its stamp) or in terrorist or armed robbery cases, if a suspect wears a ski mask.

For common felonies such as burglary, or for the majority of homicides — committed at a distance with firearms — the odds of recovering a suspect's DNA are low. There are also confounding circumstances in rape prosecutions. It is in only a minority of cases that semen-sample collections are made. And according to prosecutors, at least half of all rape defendants are unconcerned about being identified, because their defense is that the act was consensual.

Despite these caveats, the F.B.I. in particular is undeterred in its enthusiasm for DNA testing. "I am intently interested in it," Director William S. Sessions told a Florida gathering of agents in May. "I know that it must succeed and I am confident that it will."

Once the F.B.I. establishes itself in the testing business, it expects to move toward digitalizing DNA analysis results, in the same way that fingerprints are now being translated into computer codes. Assuming some sort of multi-character, alphanumeric personal DNA identity tag is found feasible, it might

be added to computerized missing persons' files, or used to help identify the thousands of anonymous deceased whose physical descriptions are logged into national law-enforcement computers.

The F.B.I. system could be of special importance in tracking down serial killers and repeat sex offenders, who are thought to account for the bulk of sex crimes. Beginning with the California sex-offender DNA profiles, the computer might eventually contain a comprehensive, standardized cross-referenced criminal file that could be scanned for possible matches between tissue specimens of unknown origin and the unique individuals who left them.

For now, DNA analysis has demonstrated its power to crack previously unsolvable cases. For that reason alone, it merits the excited attention it has received in law-enforcement circles. But as Dr. Ronald C. Dorazio, a vice president and co-founder of Lifecodes is quick to point out, "We're really only one step out of the laboratory with this."

If the legal and scientific issues DNA testing has raised are satisfactorily resolved, DNA's future applications to police work may be restricted only by the scientists' imaginations. "We've had an incredible explosion of knowledge," says Dr. Jenny of Seattle. "This technology is going to progress at a fantastic rate." ■

Senate  
Advisory  
Council  
Library

REF. KEY

## DNA FINGERPRINTING: POSSIBILITIES AND PITFALLS OF A NEW TECHNIQUE

Dan L. Burk\*

### ABSTRACT

*A technique popularly called DNA fingerprinting holds the potential to significantly impact legal evidence of identity. This article outlines the technical steps involved in DNA fingerprinting, distinguishing the test from similar techniques. The article further describes the technical limits of DNA fingerprinting, and suggests the legal questions the test may raise.*

### I. INTRODUCTION

The headlines proclaim it will revolutionize legal evidence: "DNA fingerprinting," a new method of identification that has caught the attention of the popular press.<sup>1</sup> The scientific community developed and uses this technique to investigate human genetics,<sup>2</sup> but now the technique is touted as the solution to legal questions from murder to paternity. Promotional literature from commercial firms offering the technique predict that it will be helpful in solving not

\*Dan L. Burk holds a B.S. in Microbiology from Brigham Young University and an M.S. in Molecular Biology and Biochemistry from Northwestern University. He is a J.D. candidate for May 1990 at Arizona State University College of Law.

<sup>1</sup>"DNA minisatellite analysis" would be a more appropriate title, as this article describes. The technique's popular nickname may prove to be particularly unfortunate because it creates in the mind of most persons an association with conventional fingerprinting. See *infra* note 65 and accompanying text.

<sup>2</sup>See Jeffreys, Wilson & Thein, *DNA Fingerprints and Segregation of Multiple Markers in Human Pedigrees*, 39 AM. J. HUM. GEN. 11 (1986) for a recent example.

only cases of paternity and homicide, but rape, assault, missing persons, unidentified bodies, unsolved crimes, and even hit-and-run.<sup>1</sup>

Are these predictions likely to come true? British immigration officials have relied on DNA fingerprinting at least once,<sup>2</sup> and other law enforcement applications are likely to follow. The technique has also been used to exclude suspects in one widely publicized murder case,<sup>3</sup> causing the press to call the test "foolproof," not unlike "supermarket bar code."<sup>4</sup> Jurors in a recent Florida case similarly believed the test "foolproof,"<sup>5</sup> and found the defendant guilty when no rebuttal was offered to the DNA evidence.<sup>6</sup> Courts on both sides of the Atlantic remain cautious about the DNA fingerprints, although reports in the popular press have begun to attract the notice of concerned American courts.<sup>7</sup>

This article reviews the process by which DNA fingerprints are generated, the advantages and disadvantages of the technique, and the technique's relationship to similar forms of genetic identification. Although scientific jargon and journalistic enthusiasm have previously obscured many details of the technique, a plain explanation should be comprehensible to judges, attorneys, and jurors from all backgrounds. Finally, the article raises several legal questions that stem from the technique's strengths as well as from its limitations; courts in the United States must carefully evaluate such questions before embracing this test. We must begin our description of DNA fingerprinting, however, by outlining some essential background information about DNA and its manipulation.

## II. BACKGROUND

Our bodies are composed of tiny functional units called *cells*, each of which contains information packaged as deoxyribonucleic acid, or DNA. This enormously long molecule carries information for a cell much the same way

<sup>1</sup>Background Information: DNA-PRINT™ Identification Test, Lifecodes Corporation (1986). Lifecodes is a firm offering a type of DNA test commercially in the United States; they have quite vigorously publicized and marketed their service.

<sup>2</sup>Jeffreys, Brookfield & Semeonoff, *Positive Identification of an Immigration Test-Case Using Human DNA Fingerprints*, 317 NATURE 318 (1985).

<sup>3</sup>See Begley, *Leaving Holmes in the Dust*, NEWSWEEK, Oct. 26, 1987, at 81; L.A. Times, March 11, 1987, at 113, col. 1.

<sup>4</sup>DNA Prints: A Foolproof Crime Test, TIME, Jan. 26, 1987, at 66; Washington Post, Sept. 20, 1987, at A23.

<sup>5</sup>Arizona Republic, Feb. 7, 1988, at A3, col. 1, reporting on Florida v. Andrews, No. CR 871400 (Orlando 1987).

<sup>6</sup>Id.

<sup>7</sup>Several trial courts have admitted DNA tests into evidence, but no cases have reached an appellate level, nor are any reported. A court in Rockland, New York admitted the test as evidence, and other New York trial courts are considering the matter. See New York Law Journal, Feb. 24, 1988, at 1, col. 3. Cases in Oklahoma and Pennsylvania have used DNA evidence, although the tests were insufficient to obtain convictions. See Moss, *DNA—The New Fingerprints*, A.B.A. J. May 1, 1988 at 68. A Maryland appellate court has also made passing mention of the test in its discussion of another type of genetic identification. See The Washington Post, Sept. 20, 1987, at A23; see also *Cobey v. Maryland*, No. 237, slip op. at 2 (Md. Ct. Spec. App. filed Dec. 2, 1987) (LEXIS, States Library, Omni file).

magnetic tape carries information for a stereo system. DNA interacts with cellular machinery just as the tape interacts with a tape deck. Rather than recordings of music or words, though, our DNA molecules carry instructions on how to construct and operate a human body.<sup>10</sup>

Information is often carried most efficiently in a code. Morse code carries words as dots and dashes; computer memories carry software as binary digit code. DNA also carries its information in coded form. DNA is composed of two parallel chains of *bases*. The four different bases, designated A, T, C, and G, encode information for the cell. The *sequence* of the bases in a DNA chain carries instructions for the cell in the same way dots and dashes carry words in Morse code.<sup>11</sup>

The physical shape of the DNA molecule is a "double helix" structure. This may be thought of as a sort of twisted ladder, with the rungs corresponding to base pairs. Some have compared the DNA structure to that of a zipper: two parallel strands, with teeth or bases pairing in the middle.<sup>12</sup> DNA base pairing is very specific, however: A will pair only with T, and C will pair only with G. A DNA strand can only be "zipped up," or *hybridized* with another strand that has a matching, complementary base sequence.

DNA in the cell is contained in packages called *chromosomes*. An individual inherits half of his or her chromosomes from each parent. The combined information encoded in the base sequences of the inherited chromosomes is called the *genome*; this information determines the individual's physical characteristics. Each body cell contains a complete set of chromosomes, a complete DNA "blueprint" for the entire person. No cell uses the entire "blueprint," however. Cells in different parts of the body read only the sections of DNA that they need to perform their functions.

In a laboratory, DNA may be examined by cutting the long chromosomal chains into short pieces. The DNA is cut using protein molecules called *restriction enzymes*. These enzymes will cut DNA only at very specific points. The enzyme acts as a "magic pair of scissors"; it recognizes a specific base sequence in the DNA and cleaves the DNA only at that place.<sup>13</sup> Different restriction enzymes recognize different sequences. The sequences that the enzyme will recognize may be from 4–8 bases long. Such sequences are scattered at random throughout the genome. Because the restriction enzymes cut only at

<sup>10</sup>For a more detailed discussion of DNA structure and function, see generally B. LEWIN, GENES II 17-22 (1985).

<sup>11</sup>Similarly, a sequence of ones and zeroes carries information for computers. Biological information storage and retrieval, in fact, closely parallels a computer model. The DNA molecule interacts with cellular machinery much the same way a floppy disk interacts with computer hardware. Sequences in the DNA define an "operating system" for reading and processing its coded information. The DNA code is actually a "machine language"; cellular hardware must translate the code into a different language before it can be expressed.

<sup>12</sup>Kelly, Rankin, and Wink, *Method and Applications of DNA Fingerprinting: A Guide for the Non-Scientists*, CRIM. L. REV. (London) Feb. 1987, at 106.

<sup>13</sup>See generally B. LEWIN, *supra* note 10, at 68-70.

their specific recognition sequences, digesting a person's DNA with a certain restriction enzyme will produce the same pieces every time.

As an example, consider a section of DNA as illustrated in figure 1. The section is 10,000 bases or 10 kilobases long. This DNA section happens to have three cleavage sites which would be recognized by a certain restriction enzyme. Cutting this section with the enzyme, as illustrated by the arrows, produces two fragments: one 4kb long and another 6kb long. We will call these fragments A and B respectively. Each time this person's DNA is cut with this restriction enzyme, these same fragments will be produced. The production of these fragments is a recognizable characteristic, like height or eye color. This characteristic is inheritable. Because every body cell contains a complete copy of a person's DNA, the same fragments should be produced by cutting DNA from any body cell!

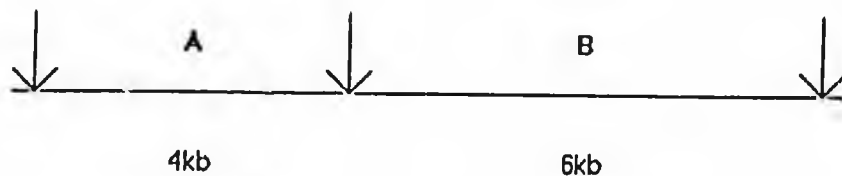


fig. 1

### III. THE METHOD OF DNA FINGERPRINTING

Just as the characteristics of height or eye color may be useful for identification, the characteristic of producing certain restriction fragments may be useful for identification. Other biochemical identification tests, such as blood typing, compare some cellular expression of information in the DNA. Identification by comparing restriction fragments would examine the DNA itself. Since the same restriction fragments are produced from each body cell, this characteristic may be particularly useful for identification based upon forensic samples—they can be identified from cells in blood, semen, or hair roots.<sup>14</sup> Be-

<sup>14</sup>Although such samples seem tiny by everyday standards, in the worlds of biochemistry or forensics, these are fairly substantial amounts. See *infra* note 28 and accompanying text. The test is not quantitative, and compared to antibody techniques such as ELISA or RIA, quite insensitive. Recently publicized reports concerning DNA typing from single hairs concern techniques far less accurate than DNA fingerprinting. See Higuchi, von Beroldingen, Sensabaugh & Erlich, *DNA Typing from Single Hairs* 332 NATURE 543 (1988).

cause they comprise an inheritable characteristic, the fragments may be useful in determining relatedness, such as paternity.<sup>15</sup>

First, though, laboratory techniques must be employed to visualize and compare the fragments from different samples. DNA molecules are far too small to be examined individually; instead, groups of identical molecules are examined. Determining the sequence of these DNA molecules would be a difficult and time-consuming task; the behavior and physical characteristics of the molecules are much easier to observe. DNA fingerprinting and similar techniques therefore test samples of DNA first for the presence of certain restriction enzyme sites, and second for the size and type of restriction enzyme fragments produced.

Comparison of restriction fragments begins in the laboratory by cutting the DNA from a sample with a restriction enzyme. Samples of the fragmented DNA are then loaded into small holes cut into one end of an agarose gel. The gel, which resembles a slab of Jell-O, is placed in a tray of an electrolyte solution. An electric current is applied through the solution. Because DNA fragments have a negative electrical charge, they will migrate toward the positive electrode at the far end of the gel as illustrated in figure 2. This technique, called *gel electrophoresis*, sorts the DNA fragments according to their length.<sup>16</sup>

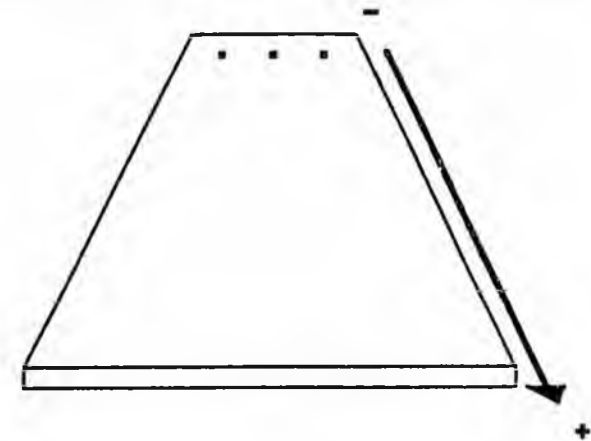


fig. 2

The movement of the fragments through a gel is similar to the movement of a person carrying a rod through a dense forest. If the rod is a short baton, she may move rapidly. If the rod is a long pole, however, her movement will be

<sup>15</sup>For discussion of a recent application, see Baird, Balazs, Giusti, Miyazake, Nicholas, Wexler, Kanter, Glassberg, Allen, Rubinssein, & Sussman, *Allele Frequency Distribution of Two Highly Polymorphic DNA Sequences in Three Ethnic Groups and Its Application to the Determination of Paternity*, 39 AM. J. HUM. GEN. 489 (1986) [hereinafter Baird].

<sup>16</sup>See generally B. LEWIN, *supra* note 10.

impeded and she will move quite slowly. By the same principle, short DNA fragments move a greater distance through the gel matrix; large fragments move more slowly. When the current is turned off, fragments of different sizes have moved different distances. Long pieces of DNA remain near the top of the gel, and short pieces are found near the bottom. Gel electrophoresis is sensitive enough to accurately measure a fragment's size by its final position in the gel.<sup>17</sup>

While agarose gels are excellent for separating fragments, the gel is messy and inconvenient for later phases of DNA manipulation. The separated DNA is therefore fixed to a thin sheet of *nitrocellulose* filter. This procedure, called *Southern blotting* for its inventor, transfers the fragments in exactly the same positions they occupied in the gel. The fragments of interest are now visualized using a *DNA probe*.<sup>18</sup>

Probes are created using sophisticated recombinant DNA technology. Using this technology, a fragment such as the 6kb length we designated B may be isolated and placed in a microorganism. There, the fragment is reproduced thousands of times. The fragment is then reisolated and purified; one strand of the fragment is labeled with a radioactive marker. The labeled strand, which we shall call B', is used to probe the nitrocellulose filter. Because DNA hybridization is very specific, B' will pair only with strands on the filter which have a matching sequence—that is to say, with fragment B. Because of the probe's radioactive label, a piece of X-ray film left in contact with the filter will show a dark band at the position where the probe pairs with fragment B. The piece of exposed X-ray film, called an *autoradiograph*, allows us to see the positions of specific DNA fragments, as illustrated in figure 3.

Just as it is possible for individuals to have different eye or hair color, it is possible for individuals to display different band positions. Some individuals' autoradiographs may show a dark band closer to the top of the gel than the place we would expect for the 6kb B fragment. This change in band position is due to a difference in the person's DNA sequence. An inheritable change in DNA is called a *mutation*. A mutation in some ancestor may have changed a restriction enzyme recognition site, and no cut will occur at that point.

If such a sequence change occurs between sections A and B in figure 1, no 6kb fragment would be created. The 10 kilobase section would remain intact. The B' probe would still recognize the matching B sequence, however, so a dark band would show the position of the 10kb fragment. Because the 10kb fragment is larger than a 6kb fragment, it will appear closer to the top of the gel.

<sup>17</sup>See generally Elder & Southern, *Measurement of DNA Length by Gel Electrophoresis II: Comparison of Methods for Relating Mobility to Fragment Length*, 128 *ANAL. BIOCHEM.* 227 (1983).

<sup>18</sup>See generally B. LEWIN, *supra* note 10, at 287-89.

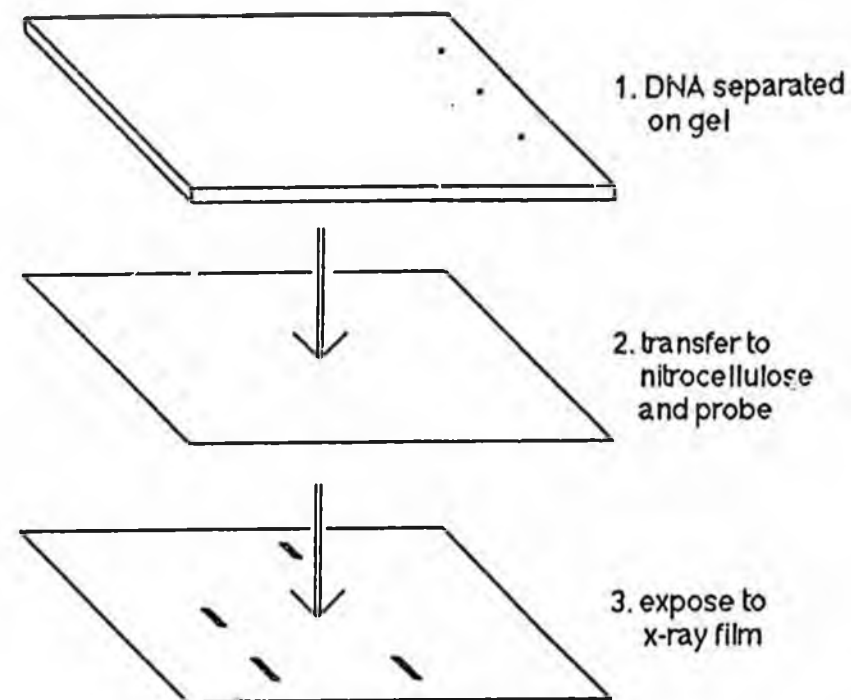


fig. 3

The presence of bands at different positions due to differences in a fragment's length is called *restriction fragment length polymorphism*, or RFLP.<sup>19</sup> The presence or absence of a certain enzyme cleavage site creates a possibility of two inheritable band positions. Such an inheritable characteristic is called an *allele*. If a person inherits the same allele from each parent, one band or the other will appear. Both bands may appear if a different allele is inherited from each parent. The three possibilities—one band, the other band, or both bands—are illustrated in lanes 1, 2, and 3 of figure 4.

RFLPs are generally discovered by accident; scientists find and characterize a few more each year.<sup>20</sup> Each is an identifiable, inherited characteristic which

<sup>19</sup>See, e.g., Baird, *supra* note 15.

<sup>20</sup>A recent example with possible forensic applications is reported by Ali, *DNA Fingerprinting by Oligonucleotide Probes Specific for Simple Repeats*, 24 *HUM. GEN.* 239 (1986).

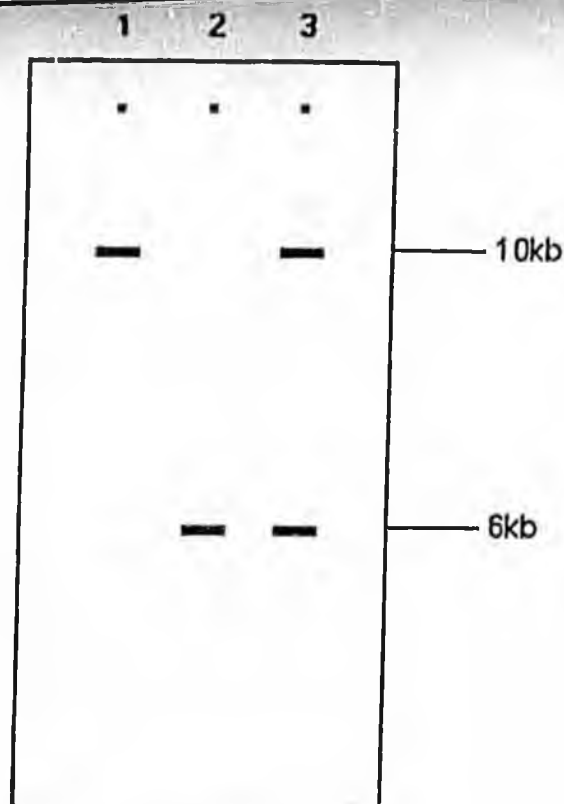


fig. 4

is somewhat useful for determining identity or relatedness. Testing for an RFLP is most useful in excluding the possibility of identity or relatedness; a person who doesn't display the allele found in a forensic sample must be the wrong person. A child who doesn't show one of a suspect's RFLP alleles cannot be that suspect's offspring. Many people in the population may by chance display the same allele, however, so that matching bands are not conclusive identification.

Some RFLPs have multiple alleles; people may display a band at more than two positions. RFLPs may show fifty or more different possible band positions. These "hypervariable" RFLPs occur when many different lengths are possible for a given restriction fragment.<sup>21</sup> A DNA fragment, such as section B in figure 5, may contain a short DNA sequence, or *minisatellite*, repeated over and over. Due to a type of chromosome rearrangement called *unequal crossing over*, these multiple adjacent repeats might occur twenty times in some people,

<sup>21</sup>See, e.g., Baird, *supra* note 13.

thirty times in other people, and so on.<sup>22</sup> Variation in the number of minisatellite repeats creates variations in total fragment length. These fragments of different length move different distances in the gel, so the 6.0kb band might therefore appear at 5.7kb, 6.2kb, or some other position.

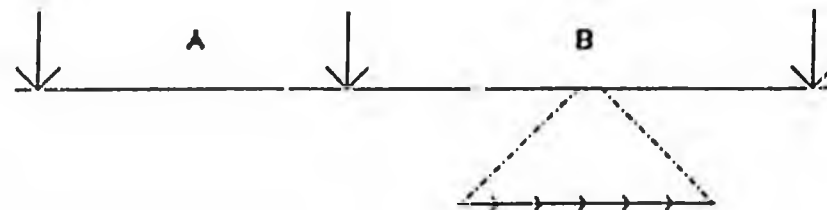


fig. 5

Naturally, an RFLP with multiple alleles is more useful in determining identification, since a smaller proportion of the population will show a given band. The chance of an accidental match is smaller. If several such RFLPs were examined, the possibility of all of them matching by chance would become quite small. The technique commonly called "DNA fingerprinting" does precisely that; it is equivalent to examining scores of hypervariable RFLPs at once.<sup>23</sup>

The minisatellite repeats which create multiple RFLP alleles occur in groups of related sequences; minisatellites with similar or identical sequences are scattered throughout a person's genome.<sup>24</sup> If the probe used to visualize fragments matches a minisatellite sequence, any fragment containing that minisatellite creates a band. Many bands appear, creating a characteristic pattern. This pattern may be very useful in determining a person's identity or relatedness by comparison with other such DNA fingerprint patterns.<sup>25</sup>

The end result of a DNA fingerprint, then, is a piece of X-ray film with dark bands showing the characteristic positions of certain fragments. The only information this test reveals about the DNA code sequence is the presence or absence of the restriction enzyme sites, and the presence or absence of the minisatellite sequences. This technique creates a pattern based on the DNA molecule's structure, and says practically nothing about the genetic information the molecule carries. In this regard, a DNA fingerprint really does resemble an ordinary fingerprint—they are simply highly individual patterns for comparison with other highly individual patterns. But how far will this analogy hold?

<sup>22</sup>See Jeffreys, Wilson, & Thein, *Hypervariable Minisatellite Regions in Human DNA*, 314 NATURE 67-69 (1985).

<sup>23</sup>*Id.*

<sup>24</sup>*Id.*

<sup>25</sup>*Id.* at 72.

#### IV. TECHNICAL LIMITS OF DNA FINGERPRINTING

In determining how useful a DNA fingerprint pattern may be for determining identification or relatedness, we must consider the limitations of the techniques used in the test. One set of possible limitations depends upon the nature of the sample examined. The "fingerprinting" test requires a relatively large sample of well-preserved DNA for analysis.<sup>26</sup> Stories of scientists extracting DNA from 2,400-year-old Egyptian mummies, while based upon actual research, have become almost apocryphal.<sup>27</sup> In reality, the DNA obtained from such sources is too degraded for fingerprint analysis.<sup>28</sup> Success has been reported in fingerprinting DNA from dried blood and semen samples up to four years-old.<sup>29</sup> However, forensic samples that weather more adverse conditions may be inappropriate for this test.

Contamination of samples may also prevent DNA fingerprinting. Bands from foreign DNA cannot be distinguished from bands of interest. For example, vaginal cells invariably become mixed into the semen samples obtained from rape victims; this has caused problems in other biochemical identification tests.<sup>30</sup> In DNA fingerprinting, this particular problem has been overcome by destroying the fragile vaginal cells in a mild detergent solution, leaving the hardier sperm cells intact.<sup>31</sup> DNA for analysis can then be isolated from only the sperm cells. A contaminated sample such as mixed blood, though, would pose a serious obstacle to accurate DNA fingerprinting identification. The test is similarly unable to distinguish between samples which may have been accidentally or deliberately substituted.<sup>32</sup>

If an appropriate forensic sample is available for analysis, we must next determine what limits on identification are inherent in the nature of the test. The greatest asset of DNA fingerprinting is also its greatest liability: the technique generates a monstrous amount of information. DNA fingerprinting attempts to analyze, all at once, dozens of RFLPs from all over the human genome.<sup>33</sup> This amount of information allows highly specific identification, but may also become obscure.

<sup>26</sup>Gill, Jeffreys, & Warrett, *Forensic Application of DNA "Fingerprints,"* 318 NATURE 577 (1985). See also Siwolop, Hamilton, Clark, & Cooke, BUS. WEEK, Dec. 1, 1986, at 128E.

<sup>27</sup>Paabo, *Molecular Cloning of Ancient Egyptian Mummy DNA,* 314 NATURE 644 (1985).

<sup>28</sup>Gill, Jeffreys, & Warrett, *supra* note 26.

<sup>29</sup>*Id.* at 578. For an editorial citing American researchers' success, see Dodd, *DNA Fingerprinting in Matters of Family and Crime,* 318 NATURE 506 (1985).

<sup>30</sup>Gill, Jeffreys, & Warrett, *supra* note 26.

<sup>31</sup>*Id.* at 578.

<sup>32</sup>Dr. Alec Jeffreys, the British scientist who developed the most sensitive version of the test, recently cautioned, "I would like, however, to point out that, contrary to statements in the popular press, this test is not foolproof. It cannot necessarily detect blood sample substitutions, whether accidental or deliberate." Dr. Jeffreys also cautioned against other difficulties discussed in this article, including mutations and closely related suspects. Jeffreys, *Highly Variable Minisatellites and DNA Fingerprints,* 15 BIOCHEM. SOC. TRANS. (London) 309, at 314 (1987).

<sup>33</sup>See, e.g., Jeffreys, Wilson, & Thein, *supra* note 22, at 69.

Three obscurative limitations stem from digesting a large amount of DNA, then separating the fragments only by their length. First, two matching bands from different autoradiographs might consist of entirely different fragments which happen to be of the same length. Second, bands within the same autoradiograph may consist of different fragments having the same length; fragments from different sections of the DNA, as long as they are the same size, will migrate together. Third, fragments which are very close together in size may obscure each other's autoradiograph bands. This problem becomes particularly noticeable at the lower part of an autoradiograph, where the small fragments run. Restriction enzyme digests generate many small fragments, creating indistinguishable overlapping bands.<sup>34</sup>

Identification therefore depends upon bands near the top of an autoradiograph, where the larger and slower moving fragments run.<sup>35</sup> Here again, some bands may obscure others. Some bands may occur in all autoradiographs; these are useless for identification. Some bands may be very faint or correspond to a very heavy band when the patterns are compared; such bands must be disregarded. As a practical matter, approximately fifteen clearly distinguishable bands "of roughly similar autoradiographic intensity" are available for comparison with other DNA fingerprints.<sup>36</sup>

A high degree of technical expertise is therefore needed to perform the DNA fingerprinting technique in its present form.<sup>37</sup> Laboratory personnel are very familiar with the time and practice necessary to make gel electrophoresis yield consistent results. All conditions of the test must be uniform before results may be compared. In addition, a degree of human judgment enters the test when the autoradiographs are interpreted. The person who determines whether or not a certain band should be disregarded should have considerable experience in reading autoradiographs.

At present, then, if the DNA fingerprinting test is properly performed under optimal conditions, about fifteen clear autoradiographic bands will appear for identification. We must consider how accurate identification will be based upon comparisons of those bands. What is the likelihood that two individuals might demonstrate identical patterns of bands? Might two people by chance generate restriction fragments of the same size and electrophoretic mobility? The answers to these questions define limits upon our interpretation of the test.

The popular press, in addressing these questions, has often quoted a probability of one in thirty billion for two individuals to display by chance the same pattern of identifiable bands.<sup>38</sup> This figure is taken from the work of British

<sup>34</sup>Jeffreys, Wilson, & Thein, *Individual-Specific "Fingerprints" of Human DNA,* 316 NATURE 76 (1985).

<sup>35</sup>*Id.* at 76 (Table 1 caption).

<sup>36</sup>*Id.*

<sup>37</sup>See Dodd, *supra* note 29.

<sup>38</sup>Among others, see L. A. Times *supra* note 5; Dec. 20, 1985, at 134, col. 2; Miller, *DNA Fingerprints to Aid Sleuths,* 128 SCI. NEWS 390 (1985).

researchers who developed the DNA fingerprinting technique.<sup>37</sup> Based upon their initial studies of twenty British Caucasians, these researchers calculated the probability that a given band would be seen when comparing two patterns. From these calculations, they estimated the probability of two individual patterns showing fifteen identical bands.<sup>40</sup>

Forensic experts have expressed some concern that the figure of one in thirty billion, so often quoted, was based upon a small, very homogeneous population sample.<sup>41</sup> The total probability of two patterns matching by chance is dependent upon the frequency with which each individual band occurs in the population. The extensive data necessary to accurately assess the frequency of a given band in the general population—or in an ethnic subpopulation—is not yet available.<sup>42</sup> Research teams in Britain and the United States are continuing their studies and remain confident that their accumulated data will show the probability of chance matches to be very low.<sup>43</sup> Until such data is available, however, sweeping generalizations about the technique's accuracy seem premature.

The British scientists who initially gave the one in thirty billion estimate also observed that the possibility of a chance pattern match increases if the subjects are closely related. The chance of any band appearing in two siblings' autoradiographs is approximately fifty percent.<sup>44</sup> The chance of two siblings showing identical patterns therefore becomes about one in 33,000.<sup>45</sup> Identical twins—the most extreme case of relatedness—naturally display identical patterns.<sup>46</sup>

This trend becomes even more pronounced where the technique is used in paternity determination. Since half of an individual's DNA is inherited from each parent, six or seven of the fifteen bands from a pattern should be identifiable in each parental pattern.<sup>47</sup> In paternity testing, then, the possibility of a chance match increases again—only half as many bands are used to establish identity. If the suspected father were wholly unrelated to the actual father, the

<sup>37</sup>Jeffreys, Wilson, & Thein, *supra* note 32, at 77.

<sup>40</sup>*Id.*

<sup>41</sup>N.Y. Times, Feb. 4, 1986, at C10, col. 5; American Association of Blood Banks Committee on Parentage Testing, *Standards for Parentage Testing Laboratories*, Dec. 5, 1986; International Society for Forensic Haemogenetics, *Statement of the Society for Forensic Haemogenetics Concerning DNA-Polymorphisms* Vienna 1987.

<sup>42</sup>Surprisingly little data has actually been published in this regard. The British researchers who performed the initial studies on Northern Europeans have also accumulated data on individuals from India, but this remains unpublished. See Jeffreys, *supra* note 32, at 314. In the United States, researchers from Lifecodes have published copiously, but almost entirely on RFLP frequency, rather than on minisatellite probes. For an example, see Baird, *supra* note 15. Unfortunately, lawyers with little science background tend to confuse these RFLP papers with minisatellite research. The legal community must realize that the accuracy and reliability of these tests are very different. See *infra* note 67.

<sup>43</sup>N.Y. Times, *supra* note 41.

<sup>44</sup>Jeffreys, Wilson, & Thein, *supra* note 34, at 77.

<sup>45</sup>*Id.*

<sup>46</sup>*Id.*

<sup>47</sup>E.g., Jeffreys, Wilson, & Thein, *supra* note 34, at 78.

probability of matching patterns is about one in 20,000.<sup>48</sup> If, however, the suspected and actual fathers are closely related, a chance match may be as likely as one in sixty-three.<sup>49</sup> The possibility of a chance match may be greatly reduced by running parallel tests. Different probes or different restriction enzymes would yield different patterns for comparison.<sup>50</sup> This, of course, is only possible if enough undergraded DNA can be extracted from a forensic sample to run multiple tests.

Finally, there is some possibility that mutation or unequal crossing over may occur within the space of a generation, altering one or two bands of a pattern. At least one such occurrence has already been observed by British scientists.<sup>51</sup> They estimate the chances of such an event happening as high as one in 240.<sup>52</sup> Such a genetic change might create one or two bands that would not match either parental pattern. A difference of one or two bands may therefore be insufficient to exclude relatedness.<sup>53</sup>

## V. LEGAL LIMITS OF DNA FINGERPRINTING

We have examined how DNA fingerprinting produces an inheritable pattern of autoradiographic bands, approximately fifteen of which may be useful in determining identity or relatedness. While more extensive studies of this technique have been called for, studies performed so far indicate that, within its proper limits, the test has an estimated chance of false positives comparable to established biochemical tests for excluding suspects. More importantly, the DNA fingerprinting technique holds the potential for individual identification of suspects. These attributes of the test raise a host of technical and legal questions which will make its use as evidence far more complex than its proponents have yet suggested.<sup>54</sup>

To begin with, what criteria will American courts consider in admitting this test as evidence? Acceptance or rejection of scientific tests by our courts tends to be a quirky and complicated process, particularly in criminal cases. One or two standards will clearly be addressed. In evaluating controversial techniques, many jurisdictions have adopted the test articulated in *Frye v. United States*.<sup>55</sup> The *Frye* court, evaluating polygraph tests, stated that an

<sup>48</sup>*Id.*

<sup>49</sup>*Id.*

<sup>50</sup>Jeffreys, Wilson, & Thein, *supra* note 22 at 71.

<sup>51</sup>*Id.*

<sup>52</sup>*Id.*

<sup>53</sup>*Id.*

<sup>54</sup>Dr. David Housman, a biologist at M.I.T., has suggested that lawyers who question the accuracy of the test "don't know basic biology." Arizona Republic, March 13, 1988, at AA2, col. 1. However correct this assessment may be, the accuracy of the test rests primarily upon principles of physics, chemistry, and even psychology. Its admission into court rests wholly upon principles of law.

<sup>55</sup>*Frye v. United States*, 293 F. 1013 (D.C. Cir. 1923).

emerging scientific test should be generally accepted in its own field before it can be admitted by the court.<sup>36</sup> DNA fingerprinting may not yet be ready for such scrutiny: clearly, many experts and professional associations are hesitant to accept the test without further study of its reliability and accuracy.<sup>37</sup> While the methods employed in this technique are commonly used and well accepted in the scientific community, the interpretation of results obtained by those methods may not be so well accepted.

Imbedded within the *Frye* standard is a particularly sticky question concerning what portion of the scientific community a court should look to for acceptance of a new test. In the case of DNA fingerprinting, should the court look for acceptance by biochemists in general, by specialists in molecular biology, or by forensic experts?<sup>38</sup> This question becomes more troublesome when one realizes that many of the experts willing to testify concerning DNA fingerprinting are employed by firms offering the test commercially.<sup>39</sup> Because of the high degree of technical skill necessary to analyze DNA, most prosecutors wishing to employ the test will be forced to rely on these commercial firms. Experts from the firms naturally paint a rosy picture of the test and its accuracy.<sup>40</sup>

Because of such problems, several jurisdictions have never adopted the *Frye* court standard, and others are moving away from it.<sup>41</sup> These courts evaluate the admissibility of new scientific tests on the same basis as they evaluate other evidence.<sup>42</sup> The Second Circuit Court of Appeals, considering the admissibility of sound voice spectrometry, or "voiceprints," stated that the trial judge must weigh the evidence's probativeness, materiality, and reliability against its tendency to mislead, prejudice, or confuse the jury.<sup>43</sup> DNA fingerprinting may face serious challenges under this standard. As previously noted, the test's reliability is still open to question. More importantly, media portrayal of the technique as magically foolproof may make the admission of the test seriously misleading or prejudicial.<sup>44</sup> Even the name "fingerprinting"

<sup>36</sup>*Id.*

<sup>37</sup>See examples *supra* note 41.

<sup>38</sup>Biochemistry is a broad field concerning the chemistry of living creatures, and so includes investigation of the DNA molecule. Molecular biology primarily concerns the study of nucleic acid structure and function; it is sometimes considered a subspecialty of biochemistry. Biochemists in general, and molecular biologists in particular, often use the techniques employed in DNA fingerprinting.

<sup>39</sup>Experts from Lifecodes have testified concerning the test's reliability in the Florida *Andrews* case and in the New York cases. See Arizona Republic, *supra* note 51; N.Y.L.J., *supra* note 9.

<sup>40</sup>Testimony from scientists performing a particular analysis is obviously important to establish that the test was done properly, the results are the best obtainable, and so on. Testimony on the overall reliability of the technique, when offered by executives from firms with a commercial interest in seeing the test widely accepted, is an altogether different matter which courts may wish to weigh accordingly.

<sup>41</sup>See Lacey, *Scientific Evidence*, 24 JURIMETRICS J. 254 (Spring 1984).

<sup>42</sup>See *id.*

<sup>43</sup>United States v. Williams, 583 F.2d 1194 (2d Cir. 1978).

<sup>44</sup>*Id.*

may create unsubstantiated beliefs and expectations in the minds of judges and jurors.<sup>45</sup>

If DNA fingerprinting is admitted into evidence, courts must then decide how much weight as evidence the test should be allowed. The test's ability to exclude a suspect will doubtless be treated in much the same way as that of established biochemical tests. DNA fingerprinting, however, has a unique potential to individually identify suspects. What degree of reliance should be placed on this attribute of the test? Courts may regard the test differently in criminal cases, requiring proof beyond a reasonable doubt, than in civil suits where a preponderance of evidence is sufficient.

Several factors should be considered in deciding how the test should be regarded in a particular case. As previously discussed, data concerning the rate of mutations or occurrence of given bands in the population is at best tentative.<sup>46</sup> Because the test's performance record is so sparse, juries should perhaps be cautioned against relying primarily upon the results of a DNA fingerprint analysis—especially if the accused's life or liberty may be at stake. This issue is further complicated by different versions of the test which have different estimated accuracies. One commercial version of the test has been estimated to yield false positives once in 200,000 times; a different firm's test has an estimated accuracy of thirty billion to one.<sup>47</sup> Courts may therefore wish to inquire into which laboratory performed the test, the laboratory personnel's level of expertise, the difficulty of their version of the test, and similar matters. Certainly prosecutors and defense attorneys should consider the weight of such factors in presenting their cases.

Similar questions revolve around the application of this technique. For example, the comparison of DNA fingerprints from different types of samples may not yet satisfy applicable legal standards. In the *Frye*, DNA analyzed from any body tissue should yield a pattern identical to the pattern from any other body tissue. Some question, though, may arise in criminal cases where semen samples are analyzed to identify rapists. Because each person receives half of his or her genetic material from each parent, sperm and ova cells contain only half as much DNA as other body cells. Each sperm cell in a semen sample will contain only half of a man's chromosomal complement, drawn at random from his entire genome. Presumably, enough sperm cells containing different portions of a rapist's total DNA complement will be present in a forensic sample to

<sup>45</sup>A similar problem occurred with the nickname "voiceprint" for sound spectrometry. See Williams, 583 F.2d 1194.

<sup>46</sup>Jeffreys, *supra* note 32; see also Jeffreys, Wilson & Thein, *supra* note 22.

<sup>47</sup>The Lifecodes version of the test examines a single RFLP; this is faster but less accurate than analysis offered by Lifecodes' competitor Cellmark. See Siwolop, Hamilton, Clark, & Cooke, *supra* note 26; see also Moss, *supra* note 9 at 69. Cellmark, founded by Dr. Alec Jeffreys, presumably uses more than one probe to achieve a far greater degree of accuracy. Cetus Corporation has also announced success with a different version of the test using recombinant DNA technology to amplify the number of DNA fragments; the Cetus test also examines a single RFLP. See Moss, *supra* note 9, at 69.

represent his entire genome. As yet, though, no published research appears to have examined whether some bands may become fainter or disappear when semen samples are analyzed against samples from other tissues. All data so far indicates that the theory holds true, but the question illustrates one area where little is known about the test's performance. Such questions are salient to determining whether the test's meager record is yet convincing beyond a reasonable doubt.<sup>68</sup>

In criminal cases, some questions about DNA fingerprinting may arise in conjunction with rights protected under the Federal Constitution. The United States Supreme Court has, for example, ruled that fundamental fairness often requires the State to provide indigent defendants with the necessary tools for an effective defense and appeal.<sup>69</sup> The cost of DNA fingerprinting by commercial firms is high; if the test becomes widely accepted, situations may arise where doctrines of equality compel states to pay for DNA fingerprinting or expert testimony.<sup>70</sup>

Previously established doctrines concerning consent and warrants for obtaining blood samples will presumably apply in obtaining samples for DNA fingerprinting. The United States Supreme Court has held that police may determine intoxication through blood samples obtained without a warrant from an unconscious person.<sup>71</sup> The Court stated that such tests are common and minimally intrusive.<sup>72</sup> Samples for DNA fingerprinting may also be obtained from sources such as hair roots or skin scrapings; these might be viewed as even less intrusive than blood sampling.<sup>73</sup>

The Supreme Court has also decided that blood samples to determine intoxication may be taken over an injured person's objection without violating the Fifth Amendment right against self-incrimination.<sup>74</sup> Even without a warrant, such sampling does not constitute an unreasonable search and seizure if the situation involves exigency and probable cause.<sup>75</sup> Unlike blood alcohol levels, though, DNA restriction fragment patterns do not diminish over time. Without such "destruction of the evidence," the exigency needed for warrantless blood sampling may not be present in obtaining "DNA fingerprint" samples.

<sup>68</sup>Unforeseen exceptions to the test's reliability are already beginning to surface. For example, recent evidence indicates that chemotherapy alters DNA characteristics in a manner that would lead to false exclusions in RFLP or DNA fingerprint analysis. See Vink, DeHoog, Reekers, DeWitte, *Changes in RFLP Patterns after Bone Marrow Transplantation* (Abstract on file with this author).

<sup>69</sup>See *Britt v. North Carolina*, 404 U.S. 226 (1972); *Griffin v. Illinois*, 351 U.S. 12 (1956).

<sup>70</sup>The Court, for example, has ruled that states may have to pay for psychiatric evaluation and testimony where essential to an accused indigent's defense. *Ake v. Oklahoma*, 470 U.S. 68 (1985).

<sup>71</sup>*Breithaupt v. Abram*, 352 U.S. 128 (1954).

<sup>72</sup>*Id.*

<sup>73</sup>See *Cupp v. Murphy*, 412 U.S. 291 (1973) (warrantless taking of scrapings from fingernails permitted).

<sup>74</sup>*Schmerber v. California*, 384 U.S. 757 (1966).

<sup>75</sup>*Id.*

Some concern may arise that DNA fingerprinting constitutes a greater degree of privacy invasion than other sorts of biochemical tests. In a society concerned with blood tests exposing the stigma of AIDS, some might fear the ultimate invasion of privacy: examination and exposure of a person's genetic makeup. This type of concern would seem to be unwarranted, and probably deserves minimal court attention. As previously discussed, this technique says virtually nothing about the genetic information the DNA molecule carries. Autoradiographic patterns created by DNA fingerprinting show nothing concerning a person's intelligence, sex, or outward physical appearance.<sup>76</sup> A highly trained scientist might glean from the patterns some information concerning genetic disease, but this is true of many commonly considered biochemical tests.<sup>77</sup>

These are only a handful of preliminary concerns which courts may be required to address in evaluating DNA fingerprinting; other questions will arise. This test, with advancing technical expertise and public understanding, shows every indication of playing a significant role in our justice system. In defining that role, courts should be aware of the technical limits of this test, as well as its unique advantages. A test currently suitable for scientific research may not yet be suitable to alter people's lives and legal positions. The legal community should therefore continue to evaluate with caution the place of DNA fingerprinting in court.<sup>78</sup>

<sup>76</sup>Dr. Alec Jeffreys has observed that a DNA fingerprint autoradiograph does not even indicate the subject's species. See L. A. Times, *supra* note 5.

<sup>77</sup>See Jeffreys, Wilson & Thein, *supra* note 2. Some sort of argument might be made that exposing information on inheritable diseases is a substantial intrusion on privacy, but this is surely outweighed by compelling state interests.

<sup>78</sup>As this article went to press, both Cellmark and Lifecodes announced improved versions of their DNA analysis techniques; the Cellmark technique was admitted to evidence in a Florida murder trial. See Marx, *Did Fingerprinting Takes the Witness Stand*, 240 SCIENCE 1616 (1988).