



## BANBURY CENTER HIGHLIGHTS

### DNA TECHNOLOGY AND FORENSIC SCIENCE

November 29 to December 1, 1988

Organized by:

Jack Ballantyne, Suffolk County Crime Laboratory  
George Sensabaugh, University of California, Berkeley  
Jan Witkowski, Banbury Center, Cold Spring Harbor Laboratory

*This meeting had the most significant outcomes of any meeting at the Banbury Center: In part as consequence of this meeting, there were substantial changes in the conduct of DNA fingerprinting. Meeting participants Peter Neufeld and Barry Scheck went on to found the Innocence Project, which as of 2017, is responsible for the exoneration of 350 individuals, 20 of whom spent time on death row; of these cases, 46% involved misapplication of forensic science.*

In 1988, forensic scientists had only just begun using DNA fingerprinting and because of the impressive nature of the techniques, the law's lack of understanding of the possible failings of DNA-base evidence and the astronomical statistics claimed for identification, DNA evidence was rarely challenged. When it was challenged, the costs could be out of the reach of defense attorneys and their clients.

However, there was a 1988 case in New York City, *People vs. Castro* in 1988 that changed everything.

Peter Neufeld and Barry Scheck were defending Castro, who was accused of murdering a woman and her daughter. Blood was found on his wristwatch, samples were taken, and DNA fingerprinting carried out by Lifecodes Corp. claimed a match between the sample and the victim. Neufeld and Scheck were participants in this Banbury meeting and, while there, discussed the DNA evidence with Rich Roberts, who had appeared an expert witness for the prosecution, as well as other scientists, notably Eric Lander.

The expert witnesses convened outside the court room and wrote a consensus statement drawing the court's attention to what they believed were serious flaws in the analysis, which rendered null and void Lifecode's conclusion that the evidential sample from the watch and victim's sample were identical.

The judge ultimately ruled some of the DNA evidence was inadmissible however, Castro pled guilty in 1989 and the case was never tried.

The papers examining the meeting's key discussions were published as *DNA Technology and Forensic Science*, #32 of the Banbury Report series. Additional publications referencing this meeting include:

Lander, E. S. DNA fingerprinting on trial. *Nature* 339: 501-506, 1989.

Lewin, R. DNA typing on the witness stand. *Science* 244: 1033-1035, 1989

Aronson, J. D. *Genetic Witness: Science, Law, and Controversy in the Making of DNA Profiling*. Rutgers University Press, 2007

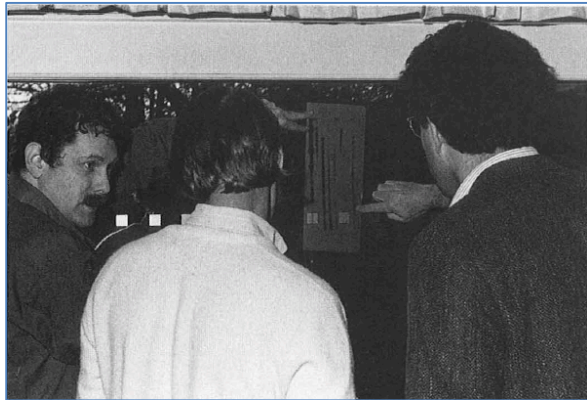


*Participants, DNA Technology and Forensic Science, 1988*



## Preface to Banbury Reports 32: DNA TECHNOLOGY AND FORENSIC SCIENCE

DNA technology is moving rapidly from the research laboratory into diverse areas of practical application. Its use in forensic science has generated considerable excitement, both in the criminal justice community and in the popular media. There are several reasons for this: First, people are always interested in crime and detective work, particularly when crimes of violence are involved and the detective work has some novel twist. Second, there is the promise of a remarkable advance in criminal identification; in the near future, criminals might be identified definitively from the DNA evidence that they leave behind. leading to the DNA identification records that might be used for identification purposes in the same way that fingerprint records are currently used. Finally, there is a general fascination with the idea that we are in some way unlocking the



*Eric Lander, Rich Roberts, Peter Neufeld*

black box of identity. To use DNA technology to detect a gene for a disease is "simply" another medical advance. To use DNA technology to identify or to characterize an individual carries the implication that the uniqueness of a human being, resident in that person's DNA, can be deciphered and written down. It is not too farfetched to see a similarity with the belief of some peoples that photographs can capture a person's soul.

The first flush of excitement is now giving way to the realities of broad implementation, which include both the problems of transforming a research technique into a routine procedure and a concern for the legal and ethical issues involved. This, in turn, is bringing forth questions as to the direction the criminal justice system should go

and how fast. Within the professional confines of forensic science, there are probably more committees looking into DNA implementation than all other issues combined. The legal community—prosecution, defense, and the judiciary—have set up advisory committees. Some states have had legislative hearings on DNA implementation or set up panels to review it. No doubt others will follow.

This volume examines some of the key questions surrounding the application of DNA technology in the legal setting and focus on questions of *policy*, not technology. The following is a brief description of each of the sections that make up this volume.

*Section 1* considers the forensic use of genetic information from a broad social and legal perspective. What impact will DNA evidence have on the justice system? Can and should DNA taken for identification be used to determine other genetic characteristics? What constraints should be placed on the use of genetic information?

*Section 2* focuses on the specific legal issues of admissibility and interpretation in court. What are the rules that govern admissibility? Should there be different standards for DNA evidence and the information derived there-from? Are there flaws in DNA technology or in the information it can provide that limit applicability?

*Section 3* addresses issues associated with the implementation of DNA technology in the forensic setting. What has been the experience with implementation to date? How do we assure a high standard of performance? Should there be regulation or accreditation of laboratories that provide DNA services and should this include private as well as public laboratories? If so, what body should be responsible, and how should it be on a state or national level?

*Section 4* outlines current and potential future approaches to the use of DNA technology for identification purposes. How do the different approaches compare? What is the potential for simplification of the



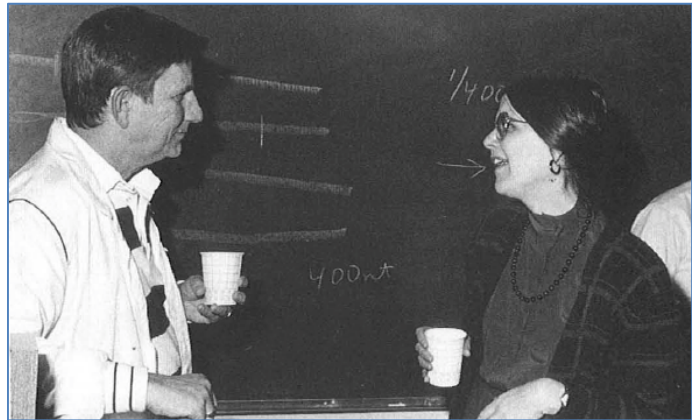
techniques by using new procedures like polymerase chain reaction or developing robotic systems to improve reliability?

*Section 5* focuses on the issue of DNA data bank development. How are existing data banks constructed and how is the information in them managed? How much standardization is necessary? What are the economics of data bank development and operation?

This wide range of topics emphasizing the relationship between modern biology and society is in keeping with the tradition of the Banbury Center. We believe that this is the first occasion on which such a diverse group of people – molecular biologists, legal authorities, forensic scientists, and policy analysts – has been brought together to discuss these issues in a workshop setting. We thank the participant for not being shy and for speaking their minds; the discussions were freewheeling, open and informative. The authors alone are responsible for the accuracy of their chapters and the opinions expressed are their own.

We also thank the staff of the Banbury Center, particularly Bea Toliver for her help and patience with the organization of the meeting and Katya Davey for her graciousness in making the participants welcome at Robertson House. We express our appreciation to the Publications staff including Dorothy Brown, Nadine Dumser, and Inez Sialiano, for their assistance in the preparation of this volume.

We are particularly grateful to Cellmark Diagnostics (ICI Americas, Inc.), Collaborative Research, Lifecodes Corporation, and the National Institute of Justice (U.S. Department of Justice) for underwriting the costs of the conference. We hope that the proceedings of this conference provide some useful and unusual perspectives on the exciting area of DNA technology and forensic science and that they will serve as the starting point for further developments.



*C. Thomas Caskey and Jan Bashinski*

*J. Ballantyne, G. Sensabaugh, J. Witkowski, 1989*



## PROGRAM

### **Session I: Forensic Use of Genetic Information -Legal and Social Issues**

Joseph L. Peterson, University of Illinois at Chicago, Chicago, Illinois  
*Biological evidence and its impact on judicial decision making.*

Arno G. Motulsky, University of Washington School of Medicine, Seattle, Washington  
*Genetics and society.*

Dorothy Nelkin, New York University, New York, New York  
*Society's use of data.*

Alan Westin, Columbia University, New York, New York, New York  
*General aspects of privacy.*

Philip Reilly, Shriver Center for Mental Retardation, Waltham, Massachusetts  
*Regulation of access to genetic data.*

### **Session II: Basic Issues - Legal and Scientific**

Peter Neufeld, New York, New York  
*The Frye test and the admissibility of scientific evidence.*

Rockne P. Harmon, Alameda County District Attorney's Office, Oakland, California  
*The Frye test: Considerations for DNA fingerprinting.*

Michael Katzer, Office of the District Attorney, Albany, New York  
*A review of present cases.*

C. Thomas Caskey, Baylor College of Medicine, Houston, Texas  
*A critical evaluation of the laboratory techniques.*

Eric S. Lander, Whitehead Institute for Biomedical Research, Cambridge, Massachusetts  
*The requirements for population studies.*

### **Session III: Transfer of DNA technology to the forensic laboratory**

Jan Bashinski, Oakland Police Department Crime Laboratory, Oakland, California  
*Laboratory accreditation, training and certification of staff in the forensic context.*

Michael Baird, Lifecodes Corporation, Stamford, Connecticut  
*Quality control and quality assurance in medical/genetics laboratories*

Edward T. Blake, Forensic Science Associates, Richmond, California  
*DNA analysis and its integration into traditional forensic serology.*

### **Session IV: Practical experiences of the transfer of DNA technology to the forensic laboratory**

Discussants: John W. Hicks, F.B.I. Laboratory Division, Washington, D.C.

John Ballantyne, Office of the Medical Examiner, County of Suffolk, Hauppauge, New York

Henry Lee, Connecticut State Police Forensic Science Laboratory, Meriden, Connecticut

Willard Carl Stuver, Metro-Dade Police Department Crime Laboratory, Miami, Florida

Barry Gaudette, Royal Canadian Mounted Police Central Forensic Laboratory, Ottawa, Canada

David Werrett, Home Office Research Establishment, Reading, United Kingdom



**Session V: Advanced DNA Techniques with Application in the Forensic Laboratory**

Shannon Odelberg, University of Utah School of Medicine, Salt Lake City, Utah  
*Tandemly repeated DNA and its applications in forensic biology.*

Daniel D. Garner, Cellmark Diagnostics, Germantown, Maryland  
*Current case experience with single locus hypervariable probes.*

Russell Higuchi, Cetus Corporation, Emeryville, California  
*Applications of the polymerase chain reaction in forensic science.*

Alex J. Jeffreys, University of Leicester, Leicester, United Kingdom  
*Minisatellite probes and the polymerase chain*

George L. Trainor, DuPont Company, Wilmington, Delaware  
*Fluorescence detection nucleic acid analysis.*

Michael Hunkapiller, Applied Biosystems, Inc., Foster City, California  
*Detection systems for DNA sequencing and specific nucleotide sequences.*

**Session VI: Establishment, Maintenance and Regulation of Databases**

Stanley D. Rose, Collaborative Research, Inc., Bedford, Massachusetts  
*Standardization of systems - essential or desirable?*

Emmet A. Rathbun, F.B.I. National Crime Information Center, Washington, D.C.  
*The NCIC experience.*

Kenneth K. Kidd, Yale University School of Medicine, New Haven, Connecticut  
*The human gene mapping database.*

Thomas G. Marr, Los Alamos National Laboratory, New Mexico  
*An analysis system and database for gel images.*

Danny Boggs, U.S. Court of Appeals Louisville, Kentucky  
*Summary*





**DNA TECHNOLOGY AND FORENSIC SCIENCE: Participants**

<b>Bernard Auchter</b> National Institute of Justice USA	<b>Michael Baird</b> Lifecodes Corporation USA
<b>John Ballantyne</b> Office of the Medical Examiner, Sussex County USA	<b>Jan Bashinski</b> Oakland Police Dept. Crime Lab USA
<b>Elizabeth Bazan</b> Congressional Research Service USA	<b>Paul Billings</b> Harvard Medical School USA
<b>Danny Boggs</b> U.S. Court of Appeals USA	<b>Bruce Budowle</b> Laboratory Division, FBI USA
<b>C. Thomas Caskey</b> Baylor College of Medicine USA	<b>Daniel Garner</b> Cellmark Diagnostics USA
<b>Barry Gaudette</b> Royal Canadian Mounted Police Canada	<b>Robert Gottheiner</b> Cellmark Diagnostics USA
<b>Lionel Grundy</b> Police Requirements Support Unit United Kingdom	<b>Rockne Harmon</b> Alameda County District Attorney's Office USA
<b>John Hicks</b> Laboratory Division FBI USA	<b>Russell Higuchi</b> Cetus Corporation USA
<b>Michael Hunkapiller</b> Applied Biosystems USA	<b>Alec Jeffreys</b> University of Leicester United Kingdom
<b>Michael Katzer</b> DA's Office, County of Albany, NY USA	<b>Kenneth Kidd</b> Yale University School of Medicine USA
<b>Joseph Kochanski</b> National Institute of Justice USA	<b>Eric Lander</b> Whitehead Institute USA
<b>Henry Lee</b> Connecticut State Police USA	<b>Thomas Marr</b> Los Alamos National Laboratory USA
<b>Arno Motulsky</b> University of Washington School of Medicine USA	<b>Dorothy Nelkin</b> New York University USA



<b>Peter Neufeld</b> New York USA	<b>Robyn Nishimi</b> Office of Technology Assessment, US Congress USA
<b>Kevin O'Connor</b> Office of Technology Assessment, US Congress USA	<b>Shannon Odelberg</b> University of Utah USA
<b>Joseph Peterson</b> University of Illinois at Chicago USA	<b>Enrico Picozza</b> Perkin-Elmer Corporation USA
<b>Emmet Rathbun</b> National Criminal Information Center, FBI USA	<b>Philip Reilly</b> Shriver Center for Mental Retardation USA
<b>Richard Roberts</b> Cold Spring Harbor Laboratory USA	<b>Stanley Rose</b> Collaborative Research Inc. USA
<b>Barry Scheck</b> Cardozo Criminal Law Clinic USA	<b>George Sensabaugh</b> University of California USA
<b>Donna-Marie Seyfried</b> Perkin-Elmer Corporation USA	<b>Marcello Siniscalco</b> Memorial Sloan-Kettering Cancer Center USA
<b>Willard Stuver</b> Metro-Dade Police Department USA	<b>George Trainor</b> Du Pont Merck Pharm. Company USA
<b>David Werrett</b> Home Office Research Establishment, UK United Kingdom	<b>Alan Westin</b> Columbia University USA
<b>Jan Witkowski</b> Banbury Center, Cold Spring Harbor Laboratory USA	