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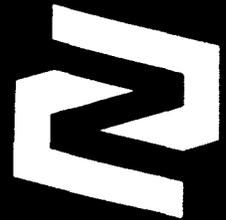
# College of Criminal Justice

at Northeastern University

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 Northeastern University

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**A REPORT ON THE THIRD ANNUAL CONVOCATION OF THE  
JUSTICE GEORGE LEWIS RUFFIN SOCIETY**

**"Genetics, Criminal Justice, and the Minority Community:  
An Introduction for Professionals in Criminal Justice"**

Northeastern University - College of Criminal Justice  
Boston, Massachusetts, September 23-24, 1994

**EXECUTIVE SUMMARY**

**ROBERT D. CROATTI**  
Associate Dean for Academic Operations  
Director of the Graduate School

October 15, 1994

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**Northeastern University, September 23-24, 1995**

**Background**

The Justice George Lewis Ruffin Society is an organization founded in 1984 to support minority professionals in the Massachusetts criminal justice system. The Ruffin Society is closely affiliated with the College of Criminal Justice at Northeastern University in Boston, Massachusetts and has developed and implemented most of its major programs in partnership with the College. The Society is dedicated to establishing greater mutual understanding between the minority community and the criminal justice profession, and promoting the advancement of minorities in the field of criminal justice. The Society is named in honor of Justice George Lewis Ruffin, who was the first black graduate of Harvard Law School and was appointed as Justice of the Charlestown Municipal Court in 1883. The Society's Board of Directors is composed of senior level criminal justice professionals with a broad range of experience in the field.

Since its founding, the Ruffin Society has worked to achieve its goals through a variety of activities. Of particular importance has been the sponsorship of Exam Preparation Courses for minority police officers -- today there are nearly fifty minority superior officers in the Boston Police Department, most of whom took the Ruffin Exam Course. A fellows program for outstanding minority college graduates interested in careers in criminal justice was established in 1987, which today offers tuition-free admission to the Master's in Criminal Justice Program of Northeastern's College of Criminal Justice, as well as a campus

residence and living stipend. The Society has also sponsored workshops and conferences on topics of interest to criminal justice professionals and the minority community.

The Society began the sponsorship of statewide Convocations in 1992. These events provide minority criminal justice professionals with the opportunity to focus on pertinent topics through expert presentations, panel discussions, and peer interactions. Other Convocation topics have included: "Listening to and Working With Minority Communities on the Problem of Crime," "Thinking Ahead: Challenges for Minorities in the Criminal Justice System in the 21st Century," and "Controlling Crime in the 21st Century: Lock 'em Up... and Then What?"

In early 1994, the Convocation Advisory Committee began advance planning for that year's Convocation. Because of its increasing importance in the criminal justice process at large, and growing significance to the minority community in particular, the committee determined that the Convocation would focus on DNA. A decision was made to concentrate both on the science and the ethical and moral considerations pertinent to its application. The committee determined that along with expert presentations, a large portion of each day's program should be devoted to workshops, designed to provide participants with an opportunity to review, test and discuss the material in a small group environment.

Overall objectives of the Convocation were to provide minority and non-minority criminal justice professionals with a basic foundation in the science of genetics as well as current developments in genetic diagnostic technology, to highlight the actual and potential application of DNA technology to the criminal justice system and elsewhere, and to underscore the implications of these developments for criminal justice policy and the law. The Ruffin Society was aided in its sponsorship of the Convocation via a grant from the

Ethical, Legal, and Social Issues component of the United States Department of Energy Human Genome Program, and the Gardiner Howland Shaw Foundation.

### **The Technical Aspects - Day 1**

Following a keynote address offered by John Hicks, Director of the DNA Database System for the State of Alabama and former Director of the FBI Crime Laboratory, the first day of the Convocation was devoted to the tools and technology of DNA. Experts from the academic, corporate and criminal justice communities spoke on genetic technology, and provided scientific background and information on the nature and applications of genetic technology. These presentations included a basic discussion of genetics, introduced attendees to the salient features of the two DNA tests in primary use in laboratories today, and touched on some of the more far-reaching possibilities of genetic engineering. Presenters of this section of the program included Dr. Richard Goldsby, Professor of Biology at Amherst College, Dr. Robert Bever, Senior Director for DNA Operations of the Genetic Design Company, a subsidiary of Integrated Genetics Company, and Dr. Richard Saferstein, formerly Chief of Forensic Science of the N.J. State Police, and currently a Forensic Science Consultant.

### **Ethical and Judicial Issues - Day 2**

The second day's content was centered on the ethical issues raised by increased interest in and dependence on DNA technology, privacy of genetic data, databanks and their control, accessibility of genetic information and the rights of the individual as opposed to the needs of the state. A group of panelists discussed the impact of DNA on their respective jobs in the criminal justice system, and a panel of experts responded to a presentation that

outlined the limitations of genetics and genetic testing. Presenters included Dr. Robert F. Murray, Jr., Chief of the Division of Medical Genetics at the College of Medicine of Howard University, Professor Charles Ogletree, Harvard Law School, and Professor Dorothy Nelkin, New York University. Panel participants included Sgt. Detective Robert Tinker, Boston Police Department, John Hicks, Convocation keynote speaker, Andrew Silverman, a member of the criminal defense bar of Massachusetts, Kathryn Higgins, Director of Law Enforcement of the National Institute of Standards, Mary Ames, Assistant District Attorney for Suffolk County, and Judge Isaac Bornstein, Superior Court of Massachusetts.

A luncheon address was provided by Dr. Henry C. Lee, Chief Connecticut State Police, Forensic Science Laboratory. He discussed advances in forensic science, the impact of the public's decreased confidence in law enforcement, and how physical evidence can assist in restoring that confidence.

Both days of the Convocation closed with participatory workshops for attendees. The first day's workshops were made up of heterogeneous groups composed of attendees from varied disciplines, and the second day's workshops pulled together attendees of similar disciplines. Discussion in the workshops was aided through a hypothetical case prepared by The Einstein Institute, an organization that translates and assists the Courts and court-related personnel in dealing with valid science and health-related information. Each workshop was aided by a trained facilitator, a recorder, and a science advisor.

### **Convocation Themes and Conclusions**

Discussions of the strengths and weaknesses of DNA evidence were one outgrowth of the Convocation's presentation of basic information on genetics and its application in the

criminal justice system. Noted among the strengths of DNA were its persuasive power, its stability (based on proper preservation), and the fact that it can not be modified or manipulated. Perhaps most important among the benefits of DNA evidence is that it has the power to exclude the innocent. Since the development of the technology, approximately one third of the suspects tested have been eliminated from consideration based on the testing. This enables investigators to move away from false trails and focus on more useful investigative avenues.

Coupled with its many strengths, attendees also pointed out the weaknesses associated with DNA evidence. First, because it is a new and complex science, it places a heavy burden on prosecutors and experts to explain it clearly to juries. Also noted was the fact that projecting the results of a small evidence sample to a larger conclusion can result in incorrect evaluations, and that it is impossible to measure how long a trace has been in a specific location. Finally, the prohibitive costs of both testing and expert interpretation can put the benefits of this technology out of reach of the poor and minority communities.

The presentation and discussion of the ethical, moral and procedural concerns relative to DNA evidence was another Convocation focus. Scientific knowledge is growing quickly, and it is important that ethical considerations are made at an equally accelerated rate. For example, twenty-eight states have already established legislation requiring that DNA samples of convicted felons, or in some cases convicted felons being granted early release be collected. It is critically important that the evidence of DNA is properly tested and evaluated and that strict standards of proficiency and accreditation are broadly adopted. The 1994 Crime Bill has set up a Commission to ensure this type of compliance on a broad national scale.

Contrary to popular opinion, there is little or no new evidence regarding genetics and behavior. While it may be true that genetic screening can determine an individual's predisposition to various diseases, various studies that have attempted to identify a "criminal gene" have been inconclusive. Convocation attendees were reminded that genetic does not mean fated, and that individuals commit crimes for many reasons. Many believe that bad genes are to blame, but criminal activity is complex and the result of a variety of social and environmental factors.

DNA is powerful evidence, although not always conclusive, and while it is a reliable tool in the making of an identification, it is not the arbiter of guilt or innocence. Because of its power, the potential for its misuse or misunderstanding must be addressed. The subject of DNA and its application in the world of criminal justice will undoubtedly be the subject of much future debate. The success of the Ruffin Society's 1994 Convocation indicates that the widely varied communities affected by this technology can continue an informed dialogue to ensure that it is applied with intelligence and integrity.

# THE JUSTICE GEORGE LEWIS RUFFIN SOCIETY

1995 - 1996

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College of Criminal Justice, Northeastern University.

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**FULL AND UNABRIDGED REPORT**

Robert D. Croatti  
Northeastern University

Honorable Rosalyn B. Bell  
Franklin M. Zweig, Pd.D., J.D.  
Einstein Institute for Science, Health & The Courts

October 15, 1994

**GENETICS, CRIMINAL JUSTICE, AND THE MINORITY COMMUNITY:  
AN INTRODUCTION FOR PROFESSIONALS IN CRIMINAL JUSTICE**

**SEPTEMBER 23 AND 24, 1994**

**REPORT**

**By Judge Rosalyn B. Bell and**

**Dr. Franklin M. Zweig**

The Third Annual Convocation of The Justice George Lewis Ruffin Society was held at Northeastern University on September 23 and 24, 1994. This marked the tenth anniversary of the establishment of the Ruffin Society. The Convocation on the subject of "Genetics, Criminal Justice, and the Minority Community: An Introduction for Professionals in Criminal Justice" was sponsored by the Ruffin Society, the College of Criminal Justice, Northeastern University, the Flaschner Judicial Institute, and the Judges of the Superior Court of Massachusetts. The Convocation was made possible in part through a grant from the Department of Energy, Office of Health and Environmental Research, Office of Energy Research and the Alan Shaw Foundation. In recognition of the Tenth Anniversary of the Ruffin Society, The Boston Globe together with Crane Paper Company, reproduced for each participant at the Convocation a suitable for framing full

November 20, 1883 edition of the  
size reproduction of the front page of the newspaper which announced the appointment of Justice Ruffin as the first African American to be appointed to the bench in Massachusetts.

### CONVOCATION ADVISORY COMMITTEE

The Honorable **Julian T. Houston**, President of the Ruffin Society, appointed a Convocation Advisory Committee to begin the planning for the 1994 Convocation. Members of that Committee were: Robert Brink, Director, Flaschner Judicial Institute; Joseph Carter, Superintendent, Boston Police Department; Robert D. Croatti, Associate Dean, College of Criminal Justice, Northeastern University; The Honorable Maria Lopez, Superior Court Department; Ms. Norma Kilson; Maria I. Pena Law Clerk, Superior Court; The Honorable Julian Houston, Superior Court Department; Dr. Franklin Zweig, President, Einstein Institute for Science, Health and the Courts; Ms. Stephanie Carey; Dr. Robert Weinberg, Professor, Whitehead Institute, M.I.T.; Eugene Monteiro, Chief, Probation Department, Bristol Superior Court; Professor Charles Ogletree, Harvard Law School; Neni Odiag, Law Clerk, Superior Court; and Laurie A. Mastone, Convocation Coordinator, College of Criminal Justice, Northeastern University. The Committee met formally as a whole three times and informally many times in smaller groups to discuss ongoing plans, to discuss candidates for speakers and logistics. The Committee agreed at its first meeting to undertake the formidable subject of DNA. The committee sought the active assistance of its membership for ideas, subject identification and presenters. An early decision was made to divide the program into (1) the science, (2) the ethical and moral considerations, and (3) the workshops. The workshops were to be designed to give the

participants an opportunity to review and test what they had learned from the presenters, to learn from each other, and to explore some of the potential dangers of the new technologies. (Copies of two early program drafts are included in the Appendix at Tab 1.)

## THE CONVOCATION

### -INTRODUCTION-

The Convocation opened in the midst of a heavy rainstorm, which in the words of the Honorable **Julian T. Houston**, President of the Ruffin Society, seemed to be designed to deter attendance. In excess of 150 attended all or part of the meeting. Despite the slightly delayed start, and reduced numbers, the enthusiasm and thirst for knowledge among those attending was contagious. After welcoming those present Judge Houston introduced **James Alan Fox**, Dean of the College of Criminal Justice of Northeastern University. Dean Fox greeted the participants pointing out that this Convocation was quite different from prior ones in that this convocation would focus on technology rather than procedure and cases. He noted that in order to keep abreast of developments in the criminal justice field, DNA and other technologies must be understood by the professionals in the criminal justice field. He emphasized that the tools, technology, ethics and morality of their use must all be understood. He commented that he had received a number of calls from individuals who pointed out the happenstance of the holding of the Convocation just

two days before the scheduled start of the trial of O. J. Simpson, in which DNA evidence was apt to play such a very significant role. Dean Fox explained that the happenstance was truly coincidental as the Ruffin Society together with Associate Dean Robert Croatti of Northeastern College of Criminal Justice had concluded a year earlier that there was a need for this type of presentation, discussion and understanding and had established an Advisory Convocation Committee to undertake the arrangements and details.

Judge Houston summarized the two day program. (A copy of the Program is attached at Tab 2 of the Appendix.) He described the program as being centered on the tools and technology of DNA, and the ethics and morality of DNA and its potential applications. He emphasized that all of these issues need to be understood. He diagramed the division of the time with the first day spent on tools and technology and the second day spent on ethics and morality, with workshops planned for both days by the reporters of the Convocation. He commented that the meetings were directed at being informative and proactive. He thanked the sponsors and the grantors for their important assistance. He expressed his particular debt to the Advisory Convocation Committee.

#### **-THE RUFFIN SOCIETY-**

The luncheon speaker for the first day of the Convocation appropriately was Judge Houston, President of the Ruffin Society. He highlighted the career of Justice George

Lewis Ruffin, gave a brief history of the establishment of the Society, and described the Ruffin Society. The members of the society are minority senior level criminal justice professionals in Massachusetts. It was established in 1984 with the objective of encouraging a greater mutual understanding between the minority community and the criminal justice profession. It seeks to promote the advancement of minorities in the criminal justice profession. Moreover by bringing together representatives of the various disciplines involved in the criminal justice system the Society seeks to foster better understanding within the larger system. It is affiliated with the Northeastern University College of Criminal Justice and through that affiliation has sought to provide its members with tools to better serve the profession. It is a nonprofit corporation under Massachusetts law with a tax exempt status under the Internal Revenue Code. The Board of Directors is composed of minority criminal justice professionals with a broad range of experience in the field. (For a more complete history of the career of Justice Ruffin, the organization and its major accomplishments, see Tab 3 of the Appendix.) In closing his remarks, Judge Houston undertook to introduce all of the officers and directors of the Ruffin Society most of whom were present. (See Appendix Tab 4 for that list.)

**-FIRST DAY - SCIENCE SPEAKERS-**

The Keynote Address was delivered by **John Hicks**, Former Director of the Federal Bureau of Investigation Crime Laboratory and the present Director of the DNA Database System for the State of Alabama. Mr. Hicks spoke on the early development of DNA

testing noting that the earliest applications primarily involved excluding alleged perpetrators. Since the development of the technology, approximately one third of the suspects tested have been eliminated from consideration based on the testing. That ability to eliminate a suspect from attention is of the utmost importance. In eliminating suspects investigators can focus away from false trails and toward more useful investigative avenues. DNA can also link the same person or persons to more than one crime, which serves to indicate a serial criminal at work. Mr. Hicks struck several themes that were echoed by many of the speakers: (1) that genes are passed from parents to offspring; (2) that except for identical twins each of us has subtle variations from others in her or his 50,000 genes; (3) that the use of the term "fingerprinting" as applied to DNA evidence is counterproductive; and (4) that clean samples and well performed DNA tests provide valuable assistance in identification. But DNA itself does not decide guilt or innocence. That decision must still be left with the fact finders based on all the evidence. Mr. Hicks introduced the attendees to the two tests primarily being used in laboratories today: The RFLP test and the PCR test. The RFLP test while more discriminating, takes more time to conduct--6 to 8 weeks or longer. It also requires a larger sample. The PCR test while a sensitive test and quick, is less discriminating. It does not require as large a sample since a part of the process includes the replication of the DNA sample. As a result the quicker test to complete--PCR--may not exclude the subject, while the RFPL test, which takes longer, may exclude the suspect. Some critics have pointed to this to show that DNA testing is faulty, but given the difference in discrimination between the two tests, such results should be not unanticipated.

Some 28 states have established legislation requiring the giving of samples to be included in a Database or Databank System. The samples are required of convicted felons, or in some states of convicted felons seeking and being granted early release. This concept of a large database collected from various sources has generated the pressure for standardization, proficiency, privacy, utilization, access, and fairness. The 1994 Crime Bill contains a section addressing these concerns and setting up a National Advisory Board to focus on these issues. Until the Board has met and come up with its guidelines the criteria developed by the Twgdam project is to be utilized. Twgdam is the acronym for Technical Working Group on DNA Methods, which promulgated standards that have been utilized in the FBI laboratory, state crime laboratories and some private laboratories. It is interesting to note that although these Databanks are in their infancy, one suspect in a first degree sexual offense is known to have been identified through the use of such a databank. He had recently received an early release from prison, and in accordance with the statute, given a sample for testing. He was identified as a suspect from the semen collected from the victim through a search of the databank. He was subsequently convicted.

A basic discussion of genetics was next offered by **Richard Goldsby**, Professor of Biology at Amherst College. He introduced the foundation of DNA from conception to birth. Aided by very helpful slides, as were all of the presenters, he described the mechanics by which the one celled zygote divides and replicates 42 times to become a full term infant with its own DNA. That DNA made up from the contribution of both parents through the process of mitosis. He also described the process by which the extraneous

unnecessary material is eliminated.

Dr. Goldsby introduced another theme that would run throughout the Convocation by discussing some of the applications of DNA beyond the identification arena: (1) After the isolation of the insulin producing gene, it could be moved into an appropriate vector and then into cells where it could produce useable insulin; (2) After the isolation of the human growth factor if it is placed in the appropriate vector, it can be placed in a mouse embryo, which will grow abnormally large; and (3) The isolated clotting factor could similarly be placed in an appropriate vector and then into a goat embryo. If the embryo develops into a female goat, the clotting factor will appear in the goat's milk. The possibilities in this type of genetic engineering are far reaching. DNA testing can be utilized to determine the traits carried by prospective parents. If both parents carry a genetic defect, they can be informed of the probability of the fetus carrying that defect. If they so desire they can, upon a pregnancy, have the amniotic fluid tested and from that determine if the fetus carries the genetic defect present in both parents. After genetic counselling, the parents then may choose to terminate the pregnancy based on their own religious or ethical standards. Lastly, Professor Goldsby spoke of populations. He asserted that clearly some traits are shared more frequently within certain ethnic groups than with the population as a whole, such as: Sickle Cell trait within the African community; crumbly ear wax within the Asian population as opposed to the smoother ear wax among the population as a whole; and the ability to drink large quantities of milk without distress in the Northwestern European Caucasoids after many years of dairying as opposed to other populations where that gene has disappeared. Dr. Goldsby agreed that opinions differ on

the need to address specific population differences or frequencies of traits in furnishing statistical probabilities of a match. He felt, however, that there were more similarities than differences among population groups; that there was no significant danger in utilizing statistical information of the population as a whole; and in fact merely presenting evidence of a match is far more risky without percentages. He concluded that the probability of another person in the universe sharing the same DNA is necessary to assist the fact finder in determining the meaning of the match.

Robert Bever, P.H.D. in microbiology, Senior Director for DNA Operations of the Genetic Design Company, a subsidiary of Integrated Genetics Company, moved past the basic components of DNA to the nature and specific methods of the testing process utilized in establishing the DNA. Dr. Bever's laboratory focuses on paternity testing, forensic analysis and bone marrow typing. In a presentation that proved to be the most technical of the Convocation, he led the attendees through the mechanics of the process to a better understanding of the typing process. He started by pointing out that 99% of the population share the same DNA. The testing focuses on the 1% differences at the genetic level. Many different types of blood testing have been utilized over the years from simple blood typing to more complex technologies. None of these other sources for testing has proved as stable as the DNA molecule. One major advantage with DNA is that once you have prepared the membrane, it can be reanalyzed. Laboratories have secured DNA from Blood, Semen, Saliva, Hair, Urine, Organs, Muscle and Bone. DNA has been used for identification in sexual assaults, homicides, serial crimes, multiple assailants and in other cases involving

biological evidence. In incest cases, the technology involves both forensic testing and paternity testing.

Dr. Bever recommends the following methods in collecting DNA evidence: (1) if it is a blood stain, air dry it then put it in a paper envelope; (2) if it is tissue or bone specimen, place it in a plastic container and store at minus 20 degrees centigrade and ship to the laboratory in dry ice.

Along with other speakers he decried the use of the term "DNA fingerprinting" and instead preferred "DNA typing" as a description of a system. In RFLP it is the variation in size that you are looking for. He described the steps in that test: (1) Isolation of the DNA from the other material; (2) Determining how much and how pure; (3) Selection of and use of the cutting or Restriction Enzyme; (4) Placing the DNA on the gel and membrane; (5) Introducing the probe, a precisely designed piece of DNA with a specific sequence. (The probes are applied to 3 to 6 loci. Four is the usual number of loci used. In determining the loci, the technician will look at different chromosomes as the 23 chromosomes differ from each other and one chromosome will not effect another chromosome); (6) Preparing of the Autorad, which is analyzed for a match first by sight and second by computer. Throughout his presentation Dr. Bever emphasized that there are different ways to proceed and different materials may be utilized in each of these steps. The essential is that the laboratory have standards that will produce reproducible results and have an dtermined standard deviation. Dr. Bever moved on to PCR, pointing out that at least one drop of blood is needed for RFLP, while only one cell is needed for PCR. PCR is a simpler process requiring, denaturing, the use of primers, making copies and analysis.

Again there are many different ways to make the analysis, all of which are, if properly done, acceptable.

He concluded his presentation with the discussion of the statistics and their importance in understanding the meaning of the match. He addressed the basic ways the statistical approaches have been used. He mentioned the Hardy-Weinberg Equilibrium, which is a condition in which the allele frequencies within an intrabreeding population are unrelated to mating patterns. The occurrence of alleles from each parent would be independent and have a joint frequency determined by the product rule. He also referred to the ceiling principle which is a conservative adjustment to account for possible population substructures in computing the likelihood of a coincidental match between DNA profiles. The ceiling principle is based on the assumption that parents are more apt to marry those with similar patterns. This occurs where intermarriage frequently occurs. While he saw little basis for the application of the most conservative approach, he acknowledged that the use of general population statistics is controversial where the suspect comes from a little tested group. This issue is currently the subject of a restudy being conducted by the National Academy of Science.

Dr. Bever informed the Convocation that in the DNA typing community for paternity testing, guidelines and standards have been adopted. In the area of bone marrow testing there is provision for accreditation by a Board. He ended on the note struck by many of the speakers, that we must look at DNA as evidence, but not evidence that is conclusive.

Richard Saferstein, P.H.D., formerly Chief of Forensic Science of the N. J. State Police, and currently a Forensic Science Consultant primarily for the defense, led off the afternoon session by pointing out what he perceived to be a contradiction relative to the admission of DNA evidence in the courts. Dr. Saferstein, began by saying that there are two kinds of forensic evidence admitted in criminal cases both of which are aimed at identification: (1) the positive identification of certain substances such as the presence of a known accelerant in a suspected arson; (2) a comparison of evidence at the scene of the crime with physical evidence of items belonging to a suspect (fibers of a coat), a part of the suspect's environment (glass embedded in the suspect's shoes similar to glass at the scene of the crime) or a part of his or her physical make up (hair, blood or fingerprints). DNA basically makes this same type of comparison--namely is the DNA type consistent with the DNA discovered at the scene. It is, however, treated entirely differently in the court room than other comparison evidence. With fingerprints, for instance, they are unique, just as DNA with the exception of identical twins is unique. In fingerprints there are 150 points of comparison. Usually the recovery is only a partial, so all 150 points cannot be compared. In England a comparison of only 16 points is required. In the United States for many years only 12 points of comparison were required. About 20 years ago the International Association for Identification concluded that there is no set number of points necessary but left it up to the individual expert to determine how many points were necessary. With DNA, in the RFLP test matches at 4 loci is generally the accepted norm although more probes can and have been run. DNA, however, unlike other comparisons, is then subjected to a great deal of scrutiny and unlike the other evidence the expert is

required to provide the details of the process and be subject to intense cross examination on the basis of her or her testing. Moreover, so far as Dr. Saferstein knows there has been no studies made on how many of the population would match on any one point of the 150 comparison points in fingerprints. The evidence of statistical probability is not raised and the opinion of the expert that there is a match is admitted. In DNA, however, the statistical probability of a match is an issue and has caused the major challenge to the admission of DNA comparison evidence.

Dr. Saferstein warned the audience that he would repeat much of what had been said by earlier speakers, but that he would try to simplify the process of DNA testing, which he did. He admitted that the explanation would oversimplify DNA. DNA is based on the concept of only four letters: A, T, G, C. A must be paired with a T and G with a C. They are complimentary base pairs. As a result, if you know one strand of the DNA, you can determine the other. As a testing tool RFLP is preeminent in the field. He posited that for instance if the one strand of the helix was from the mother and had three repeats of the progression "TAG", and the other was from the father and had two repeats of "TAG", the first step in the process would be to isolate the repeat and see how many repeats were on each of the 23 chromosomes. Very few people have three repeats of "TAG" on one chromosome and two repeats on the other. That is the basis for the comparison. To perform the test an enzyme must be selected that will isolate the repeats. Next the enzyme will cut the DNA at the repeat area. There will be other material, which will need to be separated. The membrane will be subjected to a probe or probes, which will permit the visualization of the DNA profile. The probe will only combine where it

matches.

In describing the PCR test he noted that the body must be able to replicate its own DNA and constantly rebuild. This concept is replicated in PCR. We select the part of the DNA we want to replicate. We pull apart the helix by heating it. Since each side has its requisite base pairing A/T or G/C, by placing it in the appropriate environment, the one single strand can be duplicated. This process can be repeated so that in an hour or two, the sample can be increased a million fold. This is a great advantage as the biggest problem in dealing with DNA testing is the size of the sample. Two commercial procedures are now on the market to report these results. D Q Alpha and Polymarker, both of which are validated for crime lab work. They each have probes inserted into a card. The reaction can be read with the naked eye.

Dr. Saferstein agreed that the technologies of RFLP and PCR are complimentary. He added another differentiation in their use, namely that PCR analysis can be applied to degraded material. Moreover, PCR requires only one nanogram whereas RFLP requires 50 nanograms of undegraded DNA. He suggested that there is no difference in handling the recovery of evidence at the crime scene between RFLP material and PCR material or from evidence that will be subjected to traditional serology techniques. He predicted the use of DNA Databanks may be the most significant application of the technology. He opined that together with the advent of AFIS, the Automatic Fingerprint Identification System, DNA Databanks may well revolutionize traditional investigative procedure.

He concluded with a discussion of the statistical analysis, noting that this attack on the statistical analysis is the lone remaining contested issue in DNA technology. He posited

that "when properly carried out and the work documented, there is nothing a competent expert can do to refute the result of the DNA typing." Interpretation of the match is as yet undecided. He predicted, however, that regardless of whether the scientific or law enforcement communities agree, that the ceiling principle will, for the time being, be the accepted statistical standard. He based his prediction in part on the basis that it allows an easy way out to any jurist who is uneasy about the high statistical probability brought about by other analyses. (Reporters note: Later developments are bearing out that prediction.)

Referring again to the limitations on a competent expert in the present state of the technology, he concluded with some comments on the 1994 Crime Bill, which establishes a Commission to set up standards of proficiency and accreditation, to assure that the powerful evidence of DNA is properly tested and evaluated. He predicted that this important control of DNA would and should ultimately be applied universally to traditional laboratory work.

Dr. Bever, who frequently testifies on the test results of studies conducted in his company's laboratory in both civil and criminal matters, joined the discussion on applications of DNA typing. He focused his attention primarily on the areas of paternity and genetic testing for predisposition to various diseases. He began by noting that the typing is based on Mendel's law of low mutation rates. The need for paternity testing is underlined by the fact that presently one out of every three births is out of wedlock. In the early paternity testing of blood type A, B, AB, or O, the evidence was mainly used only for exclusion. The development of the H.L.A. test and other more sophisticated tests has

resulted in more certainty and the development of statistical evidentiary studies has led most states to permit the evidence for inclusion, so long as the statistical probability exceeded 95 to 99.6% varying according to the state. In comparison to H.L.A. test, DNA offers a number of advantages and most laboratories have gone to that technique for a number of reasons (1) DNA is more discriminating in establishing exclusion; (2) DNA is nowhere near as fragile a molecule as the white blood cell the markers of which are used as the basis for H.L.A. tests; and (3) more markers are available in the red blood cell than in the white blood cell. DNA is based on classic inheritance of genetic markers. In establishing the statistical probability in a paternity test, a nongenetic evidence factor may from time to time be added. This factor represents the certainty of the nonaccess or the probability of the access. Dr. Bever submitted a number of samples of autorads, demonstrating exclusion and the probability of inclusion. He discussed a number of specific applications of genetic testing. (1) A man had died in an automobile accident. After his burial, a question arose about his paternity of a child in connection with receiving Social Security payments. There was some fluid in the pathology laboratory of the vitreous humor from his eye. While there is a very small amount of DNA in those cells, it was sufficient to do paternity testing and establish the paternity. (2) In Arizona a rare type of tree existed in direct proximity to a murder scene. A geneticist was able to establish that some leaf debris in the rear of the suspect's pick up truck matched the DNA of the rare tree, which placed the pick up truck in the vicinity of the crime. (3) Casualties of the military often are not identifiable. The use of DNA coupled with paternity testing of the parents of the missing in action has resulted in the identification of those who would

otherwise have been interred as unknown. (4) DNA testing has been applied in the early identification of a number of diseases or predisposition to disease in fetuses, for instance: Cystic Fibrosis, Sickle Cell trait, Huntington's disease, and Gaucher's disease to name a few. New discoveries are being made at an ever accelerating rate. Dr. Bever ended his remarks with a prescient look at the next day's program. He noted that the science is growing at such a fast pace, that the ethical and moral handling of that knowledge is lagging far behind. Already information is becoming available that could be used in a harmful way to the individuals who are tested.

In a question and answer period following the presentation by Dr. Bever and Dr. Saferstein, Dr. Saferstein amplified his earlier comment that a competent expert cannot contest DNA evidence, by adding that the declaration must be taken in the context in which it was made. The statement applies when and only when the test is properly done and documented in a good laboratory. That preliminary part of the statement is essential. Each case must be examined on its own merits. The defense expert must be able to evaluate the documentation. Protocols must be examined. The proficiency of the laboratory, the proficiency of the technician and analyst and the results of prior proficiency tests must all be the subject of review. These proficiency evaluations, will become even more important as newer laboratories open. He emphasized that the standards and guidelines of TWGDAM are available and are a good place to start on evaluating laboratory proficiency.

Dr. Bever and Dr. Saferstein agreed that it is not possible to date stains and if they are on driveways or other unfriendly environments, the stain may be too degraded for use.

**-DR. HENRY C. LEE-**

The luncheon speaker for the Saturday session was Henry Lee, P.H.D. in Biochemistry, Chief Connecticut State Police, Forensic Science Laboratory. The appointment of Dr. Lee as the lead forensic scientist for the O. J. Simpson case required some special arrangements. A major issue was the probability of both media and public interest in his remarks, particularly since the subject of the Convocation was to be DNA. The Advisory Convocation Committee decided to meet the concern directly and to schedule an interview and photo opportunity to the media prior to the luncheon speech. (A copy of the press release is attached as part of the Appendix at Tab 5). The Convocation continued during the interview session, hence most of the participants did not have an opportunity to observe the interview. It was referred to, however, by Judge Houston in his introductory remarks before Dr. Lee's luncheon speech. It was Judge Houston's opinion that "He is a tough interview!"

Dr. Lee began his speech with the statement that he had been asked to speak on DNA, which he posited stood for "Do not ask."

He punctuated his fast paced fact packed speech with humor and pertinent slides. He started with a recount of the current high crime statistics, and moved quickly to the issue of the confidence that the public has in law enforcement. The Criminal Justice

System is built on confidence and unless justice is done that confidence will be lost. At one time when a crime was committed testimony was volunteered and tips were plentiful. Now no one will come forward because the people have lost that confidence. Physical evidence can assist in restoring that confidence. Today we have almost 400 laboratories and hundreds of forensic scientists working on securing that physical evidence.

While as anticipated, Dr. Lee did not speak of his current participation in the forensic team for O. J. Simpson, he did speak anecdotally of his involvement in prior cases, specifically for the defense in the sexual assault trial of Willie Smith.

The primary advances in forensic science are: DNA typing/DNA profiling, image enhancement systems, tracking systems, AFIS, and artificial intelligence. Today we often take the lab to the crime scene. We can expect these new advances in technology to continue to grow and in the near future be linked, so that with appropriate input these linked technologies will within a minimum amount of time identify a suspect or suspects.

He ended his remarks with one of the major themes of the Convocation. DNA cannot decide guilt or innocence. In keeping with the subject under discussion, he then displayed pictures of his ancestors: Thomas Lee, Richard Henry Lee, Gen Light Horse Harry Lee and General Robert E. Lee.

#### **-SECOND DAY - ETHICS SPEAKERS-**

While the first day focused on specifics and the technology upon which DNA testing is based, the Second day focused on the use and potential misuse of those techniques and

technologies. Robert F. Murray, Jr., M.D., Chief of the Division of Medical Genetics, Department of Pediatrics and Child Health and Professor of Pediatric Medicine and Genetics, College of Medicine of Howard University, launched the presentations of the second day focusing on the issues raised by the evolving technology, including privacy of genetic data, databanks and their control, accessibility of genetic information and the rights of the individual as opposed to the needs of the state. Dr. Murray commenced his substantive remarks by stating that genetic testing and screening hold the basis for tremendous good or tremendous harm, that he would focus on the social and ethical considerations. He first addressed the question of when is a new finding or material ready for genetic testing or screening. Testing is the use of the information to identify a disease trait or abnormality in order to treat. Screening is to determine the potential for a problem that might not be apparent and might never become apparent. He listed seven questions that must be addressed in order to determine whether it is appropriate to proceed. (1) Who will decide when the testing or screening is ready for clinical application? What body or group will decide it is ready and what criteria will they use? (2) When is the test ready for population screening or testing? (3) When is the population ready for the screening? Even if the test is ready the population may not be prepared. (4) Should it be voluntary or mandatory? Many public health professionals believe the testing should be mandatory; many ethicists do not agree. (5) Who controls the results when they are available? (6) How do you protect from the unauthorized use of the information? Employers, lawyers, insurance companies or state officials could conceivably make use of the information for reasons they believe are appropriate, yet might ultimately harm the

subject of the test. (7) Is it appropriate to use prenatal testing for diseases that may develop later in life, such as Alzheimer's Disease or Huntington's Disease?

What makes genetic testing or screening different? Dr. Murray stated there are five principles that most ethicists agree are of the utmost importance in genetic testing and screening. The first three being the most important. (1) Autonomy. The right to decide whether to be tested and what will be done with the results. (2) Beneficence. The test should be for the good of the individual and do no harm. (3) Justice. Fairness in all aspects of the testing and use of the information. (4) Virtue and (5) Caring. From these value principles, we derive seven specific considerations that are of significance in genetic testing. (1) Privacy. Confidentiality is of paramount importance. This is particularly important, if the test is positive and we have nothing we can do to interfere with the process of the discovered trait. For instance if it were known that the trait were present, it could effect the individual's ability to secure a job, get into schools, borrow money, etc. (2) Truth telling. The test must be accurate. The truth is also of importance to other family members. This is a concern that must be addressed. (3) Informed consent. This has to do with autonomy. There is need for full information. This, however, has been the subject of much debate, as it clearly conflicts with the privacy issue. The individual tested may not wish to inform some or all of his or her family. Since family members may carry the same trait, they have a legitimate interest in being notified. (4) Personal and societal well being. It may be good for both but not always. For instance, society has an interest in wiping out certain inherited diseases. From society's point of view, that desired result might most easily be reached by preventing reproduction by those carrying the

predisposition gene. (5) Useful knowledge. It may not be helpful to have the information, if there is nothing that can be done to alter the course of the disease, or the individual might never develop the disease. (6) Adequate understanding. Knowledge and interpretation of the results is critical. (7) Equity. The rights of others may be in conflict of the right to know. In 1975, the Academy of Science issued a report listing three reasons for genetic testing: (1) treatment and management of diseases (2) to be able to provide information for reproductive decisions and (3) research to learn about the disease so we know we are producing a desirable result.

In 1972, a Task Force at Hastings Institute, an ethics think tank, undertook to develop guidelines critical to ethical conduct in testing. The participants developed and ranked five considerations. (1) Prior education, participation in the setting up of the testing, and the rules surrounding it. (2) Informed consent. The members concluded that voluntary testing was better, and if it was mandatory, there must be a good reason. In this setting, several legislatures enacted mandatory testing or screening of children. Some have eased the mandatory requirement by providing that the State would test unless the mother refused the test for the child. (3) Accurate diagnosis is essential. (4) Professional genetic testing must be in place and readily available. (5) Results must be confidential and protected.

Some eleven years later armed with the knowledge of some mistakes that had occurred during that time, the President set up a Commission on Behavioral and Biomedical Research. That Commission reported many of the same concerns, but ranked them in a substantially different order: (1) Confidentiality must above all must be

protected. (2)

Autonomy. The programs must be voluntary. If it is mandatory a very good reason must be established. (3) Knowledge. Where there is a need to know, the test results must be disclosed to other family members. This still remains the subject of debate. (4) Well being. Counselling must be in place and it must be tested to be certain it will accomplish the desired results. (5) Equity. The screening must be accessible and made available in a fair manner. Just because the test is not as cost effective for all parts of the population, should not limit its availability. A good example of the results of a violation of this last guideline concerns Tay-Sachs disease. This genetic disease has long been known to be present principally in Eastern European Jews. A program was undertaken of testing followed by genetic counselling for that ethnic group. Prenatal diagnosis was also available. As a result the disease has been virtually eradicated in that ethnic group where the program has been in operation. In the meantime, the disease has appeared in many nonjews and those of other ethnicities.

Dr. Murray made a graphic presentation of a testing process which resulted in stigma for those with testing positive. The "disease" was the possession of Sickle Cell trait. The event which triggered the testing was the unexplained death of four black servicemen at Fort Bliss. As a result of political influences, media hype and misinformation in the guise of education, many young black children were forced to undergo testing. All the children knew what was going on and they quickly discerned who tested positive, because those were sent to a counseling unit. As a result many young black children were stigmatized. Shortly thereafter, a well known doctor published a finding that those with

The debate on mandatory and voluntary testing can be illustrated with the pro and the con on the issue of mandatory testing for breast cancer.

**For mandatory testing**

Reduce mortality.

Early identification may increase life span.

Identify family members with the same problem.

**Against mandatory testing**

Not all will get it and the carriers of the trait may take unnecessarily draconian measures.

If we identify we might stigmatize in the areas of health insurance, life insurance, etc.

Family history already provides such information and it is routinely asked.

A similar chart could be drawn for most diseases that are related to a specific genetic trait.

Dr. Murray spoke of his concern about the proposals of databanks for criminal identification and the information explosion that is now accessible. He said the struggle that is going on between the benefits and potential harms which may accrue is on going. We need to try to maximize the benefits and minimize the harms by enforcing the ethical guidelines proposed.

Professor Charles Ogletree of Harvard Law School well known for his ability to ferret out the underlying biases and problems revolving around new but important issues led a discussion on the ethical, legal and moral questions that will face the criminal justice system as the applications of DNA testing and genetic testing in general increase. In that discussion he was joined by a panel. After introductions were made Professor Ogletree

began by asking each of the panelists to respond to the question "What is the impact of DNA on your job in the criminal justice system?"

**Sgt. Detective Robert Tinker** of the Boston Police Department was the first panelist to respond, saying that his work in investigation was to put together a mosaic of direct testimony and physical evidence. Physical evidence, which includes blood, doesn't lie. That evidence can lead to the perpetrator. He found DNA evidence particularly helpful in excluding a suspect. He felt it was very important evidence and would like to see it more acceptable to the courts.

The second panelist was **Mr. John Hicks**, the keynote speaker and Director of the DNA Database System for the State of Alabama, who stated that the advent of DNA had redefined the role of the F.B.I. Formerly the F.B.I. was a resource. Since DNA has become a powerful tool and the number of the for profit labs has increased, the F.B.I. has undertaken more of a facilitating role, between scientists and state and private laboratories.

**Mr. Andrew Silverman**, a member of the criminal defense bar of Massachusetts, admitted that DNA has caused him a tremendous headache, as science was not his bent. He said he gotten beyond that, however, to an understanding of the process, which he felt all in the criminal justice system would have to do. He posited that in the beginning the understanding was very difficult to achieve as it was impossible to obtain information. Since the laboratories did not publish their studies or procedures, it was difficult to discover what was being done and how the process worked. That by 1987, the private laboratories had begun to flourish and things changed. As he saw it the F.B.I. wanted a

database system for identification nationwide; therefore, it was forced to steer a move toward standardization of process, procedures and proficiency. Since that time the information on process has been forthcoming and the proficiency of the laboratories has vastly improved.

The next panelist Ms. Kathryn Higgins, the Director of Law Enforcement of the National Institute of Standards, from the perspective of a forensic scientist recognized the utilization of DNA evidence to build cases, but she saw little impact as DNA evidence was not currently admissible.

Ms. Mary Ames, Assistant District Attorney for Suffolk County, perceives her predominant role of doing justice. She has found DNA extremely helpful in the form of exculpatory evidence--as another tool in the search for justice. So far it has not been found admissible into evidence, but the education process has begun. The only issue currently is that of interpretation--the use of the statistics to say 1 in 59 million or some other number. It is certainly far more persuasive than saying the defendant is guilty because we have found type "O" blood at the scene of the crime. As type "O" blood is shared by some 40 to 50 percent of the population. It is like other comparison evidence found at the crime scene a corroborating tool.

<sup>Isaac</sup>  
<sup>orn</sup>  
Judge Beerstein, <sup>Massachusetts Superior</sup> ~~Suffolk County~~ Court, in his opening remarks stated that "it had already taught him that you can run but you can't hide." While the tests have not yet been admitted, they will probably become a part of our courtrooms. His concerns are many. Do you understand the technology? Do the lawyers understand the technology? Will juries understand? How do the tests help? Are they accurate? Does it overwhelm juries? Will

they ignore other evidence? Can the system afford to have experts on both sides? What will be the effect of the publicity? Once it is revealed that there is a match, will the trial be compromised? We need to be sure we are not convicting the wrong person.

Professor Ogletree sought to get to the root of the issue, by inquiring "From what you say it is a very complicated problem. Why don't we just say science is too far advanced for the criminal justice system?" Mr. Hicks responded that the science is ready. The F.B.I. started a long time ago . As early as 1990, O.T.A. reported that raising an issue on the validity of DNA is raising a red herring. Moreover, studies conducted by the F.B.I. established that contamination of the specimens is not an issue. Contamination will not give a false positive. Contaminated DNA may give no results, but it will not give a false positive. Ms. Ames, also disagreed with the suggestion, commenting that the adversarial system should take care of many of the problems raised. We have much more evidence accepted that is consistent with identification. Far less discriminating evidence is admitted every day. Mr. Silverman, pointed out that DNA is extremely difficult for nonscientists to understand. That jurors are overwhelmed by the 1 in 59 million type of testimony. He posited that the result is to rely on scientists and not on the jury. He pointed out we have as a threshold test the Frye test and that DNA has not yet met the general acceptance test in the relevant scientific community. Detective Tinker added that we should realize that the media attention on O. J. Simpson has the effect of convicting him in the media. We should focus on DNA as an integral part of the evidence and not as the sole or total ingredient. He believes as a jury hears these huge numbers, they will be processing it along with other evidence as a total picture and won't close their minds. Ms. Higgins commented

that she thinks we do not give the jury enough credit. Since jurors are not scientists, it is the obligation of the forensic scientist to be teachers. A forensic scientist, as an expert, is in the courtroom to instruct on the methods of obtaining, the use, and the application of DNA. The experts will need to have the ability to give the answers that will help. She did not think the jury would be overwhelmed by the one in 59 million number, but would listen to all the evidence. Professor Ogletree from time to time interjected other questions to broaden the issue, inquiring at this point "Are there any studies of how jurors deal with these numbers?" Ms. Ames said she had no idea whether there were any studies on how jurors evaluate DNA evidence. She pointed out that the jury will rarely if ever have just DNA evidence. For instance, if there is tissue under the victim's fingernails, there will probably be scratches on the suspect. The O. J. Simpson case in getting a great deal of exposure and the DNA evidence is receiving a disproportionately large amount of that attention. Professor Ogletree inquired of Judge Boorstein, whether he would be changing his jury instructions if DNA evidence is admitted with the statistical evidence of one in so many million. Judge Boorstein replied that he didn't know, but he assumed that instructions would have to be different on the burden of proof and presumption of innocence. Since he had not yet had a case in which DNA evidence was proposed, he had not considered how to present it to the jury. He wondered whether one in 59 million poses a doubt and if so is it a reasonable doubt or is it alone a reasonable doubt. No matter how we look at it. DNA is not like any other evidence, and we will have to deal with that.

Professor Ogletree moved to some of the ethical considerations asking Mr. Hicks whether there was a danger in establishing Databanks, how far should we go in testing and

whether everyone should be studied. Mr. Hicks agreed that we need to be careful in establishing these databanks to avoid the potential harm that could come from their misuse. He saw no reason why we would want to have everyone in the database. DNA information on violent criminals and sex offenders will probably be the source of most of the testing and data entry at this stage. Because they have a high rate of recidivism, they will probably be the subject of study as the most utility can be shown for electing to study that portion of the population. If it would not be productive, they will probably not be studied. The studies are expensive, so the fiscal constraints will probably serve as the limiting factor. Professor Ogletree next inquired whether the database would aid police investigation. Detective Sergeant Tinker, replied that it would be of significant help. When you bring in a suspect, you routinely do fingerprint checks, If it is a crime where identification through DNA carrying substances left at the scene is an issue, you will probably also do that test. Society has an interest in eliminating crime; if it can't eliminate it at least lessen it; but if it does occur find the perpetrator. In response to a question from Professor Ogletree on what would he do if a credible witness identified someone whose DNA didn't match the physical evidence thought to be left by the suspect at the crime scene, Sgt. Tinker said he would still continue the investigation of the suspect. Mr. Silverman agreed, saying just as there can be false positives, it stands to reason there can be false negatives or exclusions. Ms. Ames' response was that she would not take it to trial if the exclusion was clear. She would put that much reliance on the test, and eyewitness identification can and has been proven to be false. Judge Boorstein felt, that if the DNA test resulted in an exclusion, the prosecution probably would not object to its admission, and there would not be a

conviction. If there were a conviction under those circumstances, he would have to consider the motion, and probably would not disturb the jury verdict. Professor Ogletree then asked if the admission of DNA evidence would really solve anything. Ms. Higgins agreed that we will probably decide we have created new problems. Daubert and not Frye is the test in Federal Courts. Daubert is essentially a relevant and reliable test. General acceptance is just one part of the Daubert test. Many fear this will result in the admission of junk science and will increase the litigation problems in that experts with great credentials may come in and overwhelm a jury. The forensic community is concerned on this score. The jurors, however, will have to make these evaluations.

The panel then took questions from the audience. In response to a question on whether jurors had been studied on their reaction to the big numbers, Mr. Silverman said they had not. The only information he had was anecdotal, namely one juror told him, when the jury heard that only one in 59 million shared the suspect's DNA type, it was all over. Judge Boorstein was asked if the defense bar had been able to influence the Supreme Court of Massachusetts to keep out DNA evidence up to this time. He replied that the number of incarcerated persons showed that was not the case. He said the case law in Massachusetts is not that DNA is not admissible, it simply has not as yet been found to meet the criteria. The Massachusetts Supreme Court has said they will look at the issue on a case by case basis. Many new technologies have taken longer to gain recognition than DNA. Ms. Ames opined that DNA evidence ultimately is going to be admitted. The only real question will be interpretation. When she has told defense counsel that she is going to order DNA testing, they usually say "Well, lets wait to see the results." She felt this put

her in a dilemma because if she got a match, she doubts that she should even consider a plea bargain, as she no longer would feel there was any doubt as to the guilt of the defendant or that there was any a litigation risk. In the last question of the panel, Mr. Hicks was asked what percentage of felonies would involve DNA testing. Mr. Hicks replied that it was probably a relatively small one, as it would only include cases in which body fluids or tissue were involved. DNA has however changed the quality and the weight of the evidence in those cases and does require that evidence that at one time might be overlooked, be collected.

The limitation of genetics and genetic testing was the subject of the lecture by Dorothy Nelkin, Professor of Sociology and Affiliated Professor of Law, New York University. Her thesis was that the media has become enamored with the gene and has popularized it to such an extent that they are shaping the debate in ways that may prove destructive. Our trust is based on our belief that science is neutral. This has shaped much of our judicial decision making in the criminal justice arena. The gene explains individual differences, hence, we are using it to explain or justify all kinds of issues: gender and racial stereotypes, family relationships and behavior problems.

Professor Nelkin spoke of genetic essentialism. (1) The gene determines behavior (2) Future health can be predicted and can identify the predisposed. These are cultural and not scientific perspectives. She proposed to demonstrate her thesis by (1) Popular narratives (2) how they are affecting criminal policy and (3) examples.

The first narrative involved a 14 year old who killed a school mate. The question

arose--was it a bad seed or were other factors to blame. Was it environmental? She spoke of the so-called criminal gene. The question is if we our actions were the result of a genetic defect how can we be held responsible and how can we ever be rehabilitated. Her second narrative dealt with two attorneys who misappropriated funds. Both admitted to substance abuse. One was disbarred. The other claimed that he had a genetic defect which caused him to become an alcoholic. He was placed on a probation. Does that make sense? If it was a genetic defect which was to blame instead of him, how could he ever be rehabilitated. Wouldn't it make more sense to rehabilitate the one who did not have such a genetic defect? Put in as broader context, what does this say to our concept of being able to rehabilitate criminals? If the gene is the culprit, why bother. The predilection for violence is yet another issue. If you can identify a predilection to violence, shouldn't those with such a predilection be separated from the population prior to the appearance of the violent behavior? Politically it has become fashionable to shift the blame for crime from society to the individual's predisposition. It is expedient financially and therefore also politically to shift the responsibility away from society. The issue of punishment is a dilemma also. If it is because of a genetic predetermined trait, should the punishment be mitigated, because there was no ability to control--a form of diminished capacity defense; or should it be enhanced because there is no hope of this person being habilitate to a state that he or she could function in society.

The Responders to Professor Nelkin were **Professor Jonathan Beckwith** of Harvard Medical School, the American Cancer Society Professor of Microbiology and Molecular

Genetics, Dr. Richard Saferstein and Dr. Henry Lee. Professor Beckwith noted that we are in a similar period as we were in the in the early nineteen hundreds when we rediscovered Mendel's law of inheritance, which led to the eugenics movement. The scientists began to extend their ability to predict to such things as intelligence, criminal proclivity and even to seafaringness as the result of genetic traits. One of the results was the advocacy of sterilization of criminals and persons of low intelligence. Other results were the enactment of miscegenation laws, to prevent the spread of what was believed to be low intelligence; and restriction on immigration on the grounds that certain groups had undesirable genetic traits. Today's breakthroughs in genetics, new and powerful technologies, and ways of manipulating DNA have led to an climate in which more and more things are seen as genetic. The Human Genome Project has been perceived as a cure all and this is presented to the public in this manner. This has led to an environment in which we hear genetic arguments being routinely made. We have discovered more and more genes that are deterministic or predictors of a predisposition. There are two important points to remember. (1) There is little or no new evidence regarding genetics and behavior. The family studies, the identical twins studies, the adoption studies, and two studies identifying alcohol and IQ traits are and always have been controversial. There have been claims that a manic depressive trait, a schizophrenia trait and an alcoholism gene trait have been discovered. None of these have been accepted by the relevant scientific community and the manic depression claim has been withdrawn. A manic depression gene may be discovered, but we are not there yet. (2) Genetic does not mean fated. Predisposition does not mean that it is going to happen to that person. A simple treatment

may prevent it from occurring. Cystic Fibrosis expresses itself in many ways. A person with two Cystic Fibrosis genes may live a very short time or up to 30 40 years. Some may not manifest the disease at all. The more we find out the more we realize what little predictability we have. With all this, the popular view remains that if it is genetic, there little you can do. This year a number of books have come out suggesting certain racial differences in intelligence. These are not based on any new studies but on old studies that must be looked at skeptically.

Dr. Lee noted that people commit crimes for many reason. He at one time believed that criminals had bad genes. He has discovered it is much more complex and other social and environmental reasons are at play. The more research he sees the more complicated the issue becomes. He sees DNA typing matching as not being concerned with the issues of behavior prediction.

Dr. Saferstein perceives two prevailing issues. (1) Scientific reliability. There is a need to provide reliable scientific evidence in the courtroom that is worthy of acceptance. (2) Ethical considerations. The second involves issues with which he is less comfortable. As far as the forensic community is concerned, thw second issue is a nonissue. It is a vast field and one that expresses concerns, it does not touch on DNA testing. He would hope that the current forensic technology will not impede on individual rights nor will it serve as a prognosticator of future behavior. The forensic community is oblivious to that issue.

Professor Nelkin responded that these issues go beyond DNA and they should not be confused, but they are both raised by DNA research.

In response to questions from the audience, Professor Beckwith reemphasized his statement that predisposition is not prophetic.

#### **-WORK SHOPS-**

A very important part of the conference so far as the planners were concerned from the outset was to be the use of small groups to permit the attendees to discuss the subjects raised at the Convocation. The program although very full provided for two small group sessions. One at the end of the first day Friday from 4 to 5:30, and another at the same time on Saturday, the second day. The Convocation Advisory Committee, sought the assistance of The Einstein Institute for Science, Health and the Courts, in planning the small group sessions. Einstein Institute translates and assists the Courts and court related personnel in dealing with valid science and health related information and is presently preparing a balanced Desk Book on DNA for the use of the Courts.

The design of the groups were that each group would have a Facilitator, a Recorder and very importantly a Science Advisor. The Facilitators were carefully screened to be sure the persons who were selected had sufficient background to be able to provide, if needed, direction for their groups. Not surprisingly the Board of Directors and officers of the Ruffin Society provided those facilitators. The Recorders were selected from the student body of the College of Criminal Justice or those closely connected to the Institution. Most crucial was the securing of Science Advisors. Dr. Robert Weinberg of the Whitehead Institute of Massachusetts Institute of Technology provided ten post doctoral students from

the Whitehead Institute to act in that capacity.

In order to promote a discussion that crossed parochial lines, the Friday Session was to be a heterogeneous group that would include lawyers, judges, probation workers, police, etc. and Saturdays a more homogeneous group to discuss problems raised by DNA that were of particular concern to specific disciplines.

The Einstein Institute prepared a hypothetical, but typical, case to stimulate and to provide the framework of a discussion. (A copy of that hypothetical is included at Tab 6 of the Appendix.) They also produced a full training session on Thursday night before the start of the Convocation for those who could come. They presented an abbreviated training session on Friday in the mid-morning for those who could not attend the Thursday training. They also provided some individual training for those who could not make either of the first two sessions. Separate orientation sessions were held for the Science Advisors on to their roles and involvement in the small group sessions. The handouts given the Facilitators and Recorder included the hypothetical, together with enough copies for their group members, instructions for the facilitator and the recorder, and a sheet of hints on how to facilitate and record. (Copies of these handouts are included in the Appendix at Tab 7.) They also received suggested questions to use to direct the workshop's discussions one set for Friday and one set for Saturday. The questions to be addressed are enumerated in the report of each day's workshops. Each group was supplied with flip charts and magic markers as the method to be employed was brainstorming followed by discussion with consensus as

the goal. They were also each provided with tapes and a tape recorder for their sessions. Reference Schematics for the DNA Technology were also distributed. (See Tab 8 in the Appendix.)

The value of the participation of the Facilitators, Recorders and Science Advisors cannot be overstated. The large amount of material that needed to be covered governed the length of the program. As a result, no time was available for feed back in the very busy schedule, hence it was decided that each Recorder should deliver to a central location the tapes, and flip charts of their session, and that Einstein Institute representatives would attend the sessions, review the workshop materials, and prepare a report, particularly concentrating on the product of the workshops.

### Friday Workshops

About half of the day's participants attended the Friday Workshop. The groups started off introducing themselves by name and role in the criminal justice system, and in some groupssharing their reasons for attending the Convocation. The responses were many and varied: "I was just assigned a DNA case as the public defender, and I am overwhelmed;" "My job is as a sexual assault counsellor and I need to know what to tell my clients;" "I'm a chemistry professor and will be editing a book with four chapters on DNA and I would like to know more about the judicial perspective on the subject;" "As a police officer, I want to know more about the subject;" "In sexual assault cases, we often have little or nothing to go on, and I want to know more about DNA and databanks as I think it will give us a greater chance to identify the offender in these cases;" "As a

prosecutor, I need to know what it is and what kind of questions to ask on voir dire. I also want to know what kind of questions the defense is apt to ask;" "DNA is the wave of the future, and I need to know as much as I can, so I will know what questions I need to ask of the expert;" These are just samples of the responses made to why the participants came to the Convocation.

One of the groups started their workshop by asking their Scientist Advisor to review DNA with them. In doing this, it became apparent that some of the participants in that group had some misunderstanding of some of the basics of DNA, hence this proved a valuable alternative for this group. It bore out the necessity and importance of having the Science Advisors assigned to each group. All the groups utilized their Science Advisor frequently and profitably during the workshop. Each group developed its own dynamic and major thrust: for instance, as mentioned one focused largely on reviewing the science, one took a highly skeptical view of the utilization of DNA in the courts at all, (that group did appear to be disproportionately represented with defense counsel); another spent considerable time pursuing the issue of the defendant's rights to due process; and yet another was prescient of the next day's concern in its discussions of databanks and their potential for their abuse.

The hypothetical case was supplied to all the participants as a basis for their discussions. In their training, the facilitators were told that in view of the current proceedings in California, the group might center on the O. J. Simpson case. The suggestion was made to the facilitators, that if that occurred they should permit and encourage the group to utilize that situation, but still use the hypothetical to cover any

- . Only a small amount of the evidence is needed.
- . Power to exclude the innocent.
- . It can eliminate suspects and focus on other suspects. It can also narrow the investigation, thereby aiding and directing it.
- . It is impartial not biased. You can't manipulate DNA.
- . Consistency and Reliability. DNA does not change. One group noted that unlike individual witnesses, "once done it doesn't die; it doesn't recant its testimony or decide not to prosecute."
- . It may still be able to be used if degraded.
- . Once there is a large database, it should prove to be of major assistance in police investigation.
- . It is considered hard evidence, and jurors like hard evidence.
- . DNA can't be modified by the perpetrator. Generally it is more difficult for the perpetrator to remove traces of DNA, than to remove or prevent fingerprint traces.

2. What are the weaknesses of DNA evidence?

- . Complexity of the science was a primary concern of all the groups. There was agreement among all the groups that the complexity of the process was a weakness. This puts a burden on the prosecutor and the expert to explain it well enough for the jurors to deal with the issue. That could and would be exploited by the defense. In each group a dichotomy arose whether because

of the complexity, the jury would decide there had to be a reasonable doubt, or would give up and conclude that if the scientists say it is so, it must be so. If it is the latter the complexity would be a strength from the prosecutorial point of view, while a weakness from the defense point of view..

- . An expert is necessary

- . The expert must be able to communicate with the jury and be able to give a cogent explanation of the science.

- . Too much reliance on science.

- . You can't measure the time factor. That is you can't tell how long the trace has been there.

- . The testing is expensive, both for the test and the expert. One group suggested that because of the cost, DNA is potentially a technology to use against the poor and minorities.

- . Margin of error. (Projecting small evidence sample to larger picture can pose a problem . The sampling procedure raises another issue.)

- . It is a New Science

- . No absolutes. Despite the power of DNA, it cannot determine who did the crime. It is only evidence to exclude or to assist the jury.

- . Ethical issues. One group presaged the next day's discussion with the concern about how DNA may ultimately be used or abused.

- . Overestimation of persuasive value

- . That the RFLP test takes too long to complete.

- . There were those in one group that believed that the strength of DNA of its persuasiveness could also be viewed as a weakness. This was expressed in two different ways: (1) Its power made juries overwhelmed by it to the exclusion of other evidence and (2) because it is so powerful, it is subjected to contest at every step of the judicial process.
  - . That same group listed weakness in the chain of custody issue, problems of self regulation in the labs the need for certification and other issues of proper protocols and supervision. They also raised as weaknesses the issues surrounding the testing of small populations, and interpretation problems. These will be detailed as concerns in later questions.
  - . In another group, clearly not with a defense perspective, listed as a weakness the present inability to get it into evidence in Massachusetts.
  - . One last concern or weakness, was that ultimately jurors will begin to expect DNA evidence even in a case where it is not appropriate.
3. Has the general public put too much credence in DNA tests?
- . The consensus, with some qualifications (see first weakness above) was that the public had put too much trust in scientists. There was also consensus that the media hype over DNA had served to confuse the public rather than educate. For instance, the term "DNA fingerprinting" has become a favorite with the media, despite its lack of approval in the forensic community. The consensus carried over to the general feeling that the public was being misinformed, making the task of both the prosecutor and the defense more

difficult. There as no disagreement that it would be the task of the prosecutor to have the science explained in a way that is understandable, but the defense will undoubtedly seek to exploit the complexity to produce confusion. Most agreed that when properly presented from both sides, most jurors would consider DNA along with all the other evidence.

4. Should laboratories be subject to certification and regular external blind proficiency testing?

. Yes. All the groups agreed that there was great need for certification. Specifically laboratories needed to have standardization within the laboratory, they needed tp be subjected to blind proficiency testing and they needed personnel testing and supervision of the procedures and the proper controls. There were few dissenters, to the contention that self regulation was in place and was sufficient. Most concluded that therewas too much at stake to rely on that procedure.

5. If yes, how can the costs be justified as in most cases if the lab is charged it will come back as a part of the charge for the testing which will usually be at the public expense?

. As a part of this question most groups got into a discussion on when testing would be done. There was no consensus on this and it does not appear that it will become the subject of a policy within the near future, beyond that of a case by case basis. Some felt it would be done where the case was strong but could

use a little more assurance, others thought it would be done where the case was too weak without it. Both groups assumed that it would be the prosecutor's choice.

- . Most of the discussions on this question revolved around the right of the defendant to insist on his or her own expert. There was agreement that once the protocol is known and available and the work documented, the defense will probably not try to have the tests rerun, as that could only serve to provide further identification material. At that stage, the documentation, the test results, and the sample material can be submitted to the defense expert who can tell whether the process is assailable. This approach would ordinarily be more productive than a rerun of the test itself, even if feasible. They agreed even if it is expensive and that is a cost we must bear as a free society. This was particularly well put in one group, in which it was asked are we concerned only with crime control or do we care about due process. If we are going to continue to be a due process nation, we cannot allow money to be the dividing line. In other words, if a defendant can afford to do what is needed he or she can get off, if the defendant cant afford to do what is needed, she or he stays in. The expense cannot be the determiner.

- . That same group also looked at the question as it related to the added expense of certification of the laboratories, and concluded that those costs were just another cost of a free society.

6. Should DNA tests be admitted if reliable population statistics of the specific heritage

lawyers, which led to the particular emphasis of exchanges in that group. Their interests were largely in the arena of how DNA would effect their roles in the criminal justice system in the prosecution or defense in planning strategy and in the courtroom. Group (2) started off with the question "How do we get to understand the technology so that we can we use?" and "Why do we need the statistical information?" They went on to discuss how we get to the point where we have a viable and understanding? Seeking an answer to the question of how many markers or probes are needed to prove the identity beyond a reasonable doubt, they looked at the differences between RFLP and PCR. As could be expected from the different routes the two groups took, Group 1 dealt more with strategy and tactics, for instance, the group discussed the importance of how to present the statistics to the jury. For instance, defense counsel preferred to discuss 1 out of a thousand as opposed to saying that this DNA type excludes 99.9% of the population. That strategy in part was because they could relate 1 out of 1000 to numbers in the community for the jury i.e. in a town of 200,000, statistically it could have been the DNA of any of some 200 residents of the city. Group 2 dealt more with the specific science underpinnings. One of their inquiries went to the issue of how many probes would be needed to state that the identification was certain beyond a reasonable doubt. The Science Advisor, replied that it depends upon how much of a margin for error the investigating officer or the court is willing to accept. Both groups depended more on a interaction with the Science Advisors than they did the first day. While, it could have been the make up and division of the groups, and their self selection to remain, the give and take indicated greater comfort with the subject matter.

Also the Saturday groups made less use of the hypothetical and less use of the proposed questions. Additionally, since there was a combination of prosecutors and defense counsel, in Group 1, there was little consensus on answers, but there was a clear consensus of concerns. To a lesser extent this was also true in Group 2

To the extent that the specific questions posed were addressed, these were the responses:

1. Revisit: What are the strengths of DNA evidence?

Group 1. Prosecutors, defense counsel, general practitioners and law students:

. While this group did not review the strengths, one comment was made that was quite significant. Referring to the presentations and particularly to a comment made in one of the workshops, the speaker quoted this statement. "DNA has changed the whole focus from who did it to motive." The facilitator, commented in response "We have been told throughout this Convocation that DNA is not the determiner of guilt or innocence, it is just another piece of evidence, but it is a blockbuster piece of evidence. That is why we are at this convocation." There was no quarrel with or dissent to either comment.

Group 2. Police officers, probation officers, correction officers and others:

. This Group did not spend much time on this question either, rather acknowledging that it as a given that the science is reliable.

2. What changes, if any, did you make from Friday's answers to question 1?

Group 1.

. Need to have more loci for more certain identification

Group 2.

. Must decide what markers to classify for a database

3. Revisit: What are the weaknesses of DNA evidence?

Group 1:

. The impact of the DNA testing may depend upon the expert presenting the evidence to the jury. A particularly good communicator with enhanced credibility could take on an undue significance in the outcome of the case.

. The presentation is difficult to make to the jury, particularly the statistics.

. The percentages are misleading to juries.

. The databases are not sufficiently large, therefore they are inadequate.

Group 2:

. As databases expand, we need more markers for each individual to establish the differences.

. The lack of standards and the complexity of the process remains a weakness of DNA typing.

. The probe standards of four may be clear to the scientists, but are not clear to the lay person or to those in the criminal justice system.

. PCR vs. RFLP (RFLP the standard in forensics). Comparison between the

two and choice of tests continues to be considered as a weakness by this group. They understood the reasons and exigencies of using one rather than the other, but remained unclear on the distinctions between the meaning of each.

- . Tests conducted in different locations. This tends to lead to distrust of the process.
- . Zone of variability with RFLP.

4. What changes, if any, did you make from Friday's answers to question 3?

Group 1:

- . Ceiling principle. Many could see no reason why the application of the ceiling population was not a good compromise at least for the time being.

Group 2:

- . The need for more standardization in labs.

5. What problems do you see that DNA evidence will present to your discipline?

Group 1:

- . Privacy and confidentiality.

The ability to access the information - it is too easy to access.

The legal implications, criminal justice ramifications.

Systems of information may be linked increasing the danger to the privacy

- . Misuse of the information.
- . Individual rights vs. the good of society
- . The fear of knowledge, the right to know
- . Confidentiality (i.e. doctor)
- . Purpose of testing: health concerns vs. identification (labs should reflect this distinction)
- . Limit to the quantity of the sample
- . Potential of use of the sample later on as a reflection of increased knowledge in connection with DNA. The group was concerned that some future uses might be for the public good, such as discovery in connection with disease and its patterns. They were, however, concerned that unless there were clear controls, the potential for abuse was high. For instance, they were highly skeptical that the military was taking samples to identify individuals who were killed in combat. They were more inclined to believe it was to assure an accurate body count. Most felt that the identification might be a valuable byproduct, but that based on the prior track record of the military, it was highly unlikely that that was the sole reason, or even the primary reason.
- . Computerization of information.
- . Testing as a choice/right.
- . Testing may be discriminatory.
- . Use of the samples is unknown.

. Access to records after death. Under Massachusetts law, there is no right of privacy after the death of an individual. If used to establish genetic traits, what use might be made of the information that would relate to offspring who are still living?

. Scientific use should be appropriate, but needs to be controlled.

Group 2:

. Applicability of DNA information to particular minority groups could create problems. Integrity of files and database must be maintained. One member of Group 2 has been a long time member of the police department. He stated that he was aware of the concerns that the databanks of DNA might be used against the minority community. He agreed that privacy and confidentiality must be preserved, but he had throughout his career never seen fingerprint information abused. He believed that there was no danger that the police community would abuse that need for privacy in connection with DNA.

. This science could not be exact enough to remove a reasonable doubt. DNA can only corroborate.

. Issue is weight to be given to DNA.

Low threshold of persuasion is needed with DNA.

A high threshold of persuasion is needed without DNA

. Cost of DNA testing is a current issue.

. DNA Databank is good, but how do we use it.

. Must decide what RFLP markers are important to classify DNA types (Example-

ways, there was no consensus that this was appropriate.

Group 2:

- . Confidentiality in the transfer of information
- . Use DNA in criminal justice system, but we must have rigid safeguards of information
- . Controls on what is done with DNA blood sample
- . It is imperative that we try to enforce the privacy of the DNA information; however, the group did not think it would be effective.

#### Workshop Summary

It should be particularly gratifying to the Advisory Convocation Committee and the presenters that except for the most technical parts of the presentation virtually all of the themes and concerns were mentioned or expressed in the workshops. It was very apparent that the Friday groups seemed to have some doubts about the reliability of the process, while by Saturday, they were suspect of the proficiency and the abilities of some of the experts, but aside from the interpretation, had formed a consensus that DNA was what most of the scientists said it was, a reliable tool in the making of an identification, but not the arbiter of guilt or innocence. A difference between the two days also, was the willingness to ask more and more insightful questions of the science advisors. This could be attributed to the self selective factor--namely these are the ones who elected to stay to the second workshop. But since these persons were also at the first workshop, it might better be explained through what they learned from each other at the first workshop and

the added information of the second day, particularly the balance given by the presenters on the moral and ethical issues.

### -CONCLUSION-

At the conclusion of the program Judge Houston expressed his appreciation and that of the Ruffin Society to the presenters and the participants.

The themes of the program surfaced many times. DNA is accepted in the relevant scientific community. When properly carried out and the work documented, the reports are virtually unassailable as to what it shows. There remains for solution the interpretation of DNA through statistical analysis of populations. While it may be overconservative based on the standards of some, the ceiling principle is probably going to be the most used interpretation for the time being. The science of DNA is complex, but can be understood in terms of its matching. It is the task of the expert to make that evidence understandable to the fact finder. It is the task of the judge to instruct the jury on what to consider in connection with the DNA evidence. While very powerful evidence, DNA does not determine guilt or innocence, but it must be considered along with all the other evidence. The advent and growth of DNA technology, is closely allied with the Human Genome Project, which continues to advance with ever increasing rapidity. The fact that an individual has a particular genetic trait, however, does not necessarily mean that the individual will develop the disease or condition. This new technology, carries with it the potential for tremendous benefits and tremendous harms. We need to be mindful of these