Several high-profile cases have raised our national awareness and expectations of forensic science and scientific evidence and highlighted several serious points, including:

- Forensic science begins at the crime scene.
- Proper evidence collection is crucial.

Forensic science can be defined broadly as the application of scientific knowledge to the legal system, and includes disciplines such as serology, pathology, molecular biology, biometrics (fingerprint analysis, voice recognition and identification), trace evidence (hair, fiber, and paint identification) and weapons identification. Forensic technology can be defined as the tools or methods used to apply this scientific knowledge.

The lab can do nothing without the physical evidence gathered by police and evidence technicians; it is the fuel that runs a forensic laboratory. The quality of this evidence must be as secure as the crime scene itself.

- Forensic science must apply only those scientific techniques and procedures that are solidly grounded through previous experimentation.
- Standards for qualifying technicians and scientists must be followed.
- Standard procedures must be adhered to during evidence collection and analysis.

If the forensic science methods and technologies are untested, unstandardized, or misapplied, or if the examiner’s qualifications are shaky or blemished, the value of the evidence can be diminished to the point where the evidence might as well never have been collected, analyzed, or presented in court.

- The examination of many different types of forensic evidence must be pursued; some types of evidence may be routine and inexpensive (fingerprinting), while other types may be more time consuming and quite costly (DNA).
- The latest developments in forensic science require cooperation among Federal, State, and local governments as well as private agencies in all branches of the criminal justice system.

The more evidence, the stronger the case. The more scientifically grounded the evidence, the more prosecutors will be willing to use the evidence to strengthen a case. Police and evidence technicians, laboratory analysts, and attorneys must cooperate with each other to ensure proper use of this evidence. Cooperation requires knowing how one action affects another, how not collecting a certain type of evidence will preclude using a certain forensic technique, or how collecting a certain type of evidence requires using a particular forensic test rather than any other.

Knowing how one action affects another in the long chain of events leading toward the presentation of scientific evidence and expert testimony requires communication among the involved parties. To aid in this communication, this bulletin presents information on recent advances in forensic science.
technology and evidence collection funded by the National Institute of Justice (NIJ). NIJ is the primary Federal agency funding forensic science research and development in support of State and local law enforcement. NIJ accomplishes this mission through its Office of Science and Technology (OS&T), which awards research grants and leverages the resources of Federal laboratories and its regional National Law Enforcement and Corrections Technology Centers.

By awarding grants to leading scientists and research centers around the country to fund forensic science projects as diverse as DNA profiling and the development of a portable device for visualizing latent fingerprints, OS&T is updating forensic science and bringing advanced technologies into more systematic use. By setting testing standards, offering training, and developing certification programs for forensic examiners, OS&T is ensuring the accurate application of this advanced technology by crime labs across the Nation. This bulletin describes new methods of physical evidence analysis as well as recent developments in automation for such analysis that have been produced through NIJ research. Specific products that are currently available to law enforcement are also highlighted.

**DNA Identification**

DNA typing is probably the most highly publicized and widely scrutinized forensic science technology being employed today. DNA typing involves extracting the genetic material deoxyribonucleic acid from the cells of human blood, bloodstains, seminal stains, and other biological tissues. DNA extracted from evidence samples taken from the crime scene is compared with DNA from samples taken from the suspect or compared to other analyzed samples from DNA databases.

The presentation of biological evidence, in particular the use of DNA testing to determine the identity of sources of tissue at the crime scene and elsewhere, is important for both the prosecution and the defense, and cannot be overemphasized.

When DNA first became admissible as evidence in criminal court cases in the late 1980s, the only typing method available was Restriction Fragment Length Polymorphism (RFLP). It was expensive and time consuming because it had to be performed sequentially at every location on the DNA chain chosen for analysis, and criminal cases generally required looking at four to five locations to ensure an appropriate statistical estimate of a chance match. With the advent of the Polymerase Chain Reaction (PCR) method, analysis has become much less costly and time consuming. One of PCR’s greatest benefits is that analysis requires only a very small evidence sample—in the future, a single nucleated cell will suffice. DNA typing is no small feat, and when seemingly unsolvable cases arise, nationally renowned forensic laboratories are often called to action.

**DNA Identification Act**

The Violent Crime Control and Law Enforcement Act of 1994 included the DNA Identification Act of 1994, which provided the funds necessary for NIJ to fund the Forensic DNA Laboratory Improvement Program. This funding is provided to State and local crime labs to initiate, upgrade, or expand DNA testing for casework and for DNA database implementation. This effort is in conjunction with the FBI’s Combined DNA Index System (CODIS) to assure compatibility among local, State, and Federal databases.

The DNA Identification Act also established, under the director of the FBI, a DNA Advisory Board (DAB). The DAB brings together the foremost scholars, researchers, and laboratory professionals in DNA testing to set standards for quality assurance, including issues such as the qualifications of lab directors and analysts, and the accreditation, certification, and proficiency of labs and analysts.

Under the DNA Identification Act, NIJ was asked to determine the feasibility of blind external DNA proficiency testing in public and private laboratories. In response to this, NIJ funded research at the University of Illinois at Chicago, under the direction of Dr. Joseph Peterson and Dr. Robert Gaensslen, to determine the feasibility of this type of testing. If such testing is determined to be unworkable, the researchers will explore other types of external proficiency testing that could be successfully conducted to assure the public that DNA evidence is reliable. As part of this feasibility study, NIJ established a National Forensic DNA Review Panel to review and recommend how external DNA proficiency testing should be conducted in public and private laboratories.
**NRC Study**

In 1992, NIJ formed a consortium of Federal agencies to fund a National Research Council (NRC) study of forensic DNA testing, which resulted in the report, *DNA Technology in Forensic Science*. This initial NRC report concluded that forensic DNA testing is a reliable science. It also strongly endorsed standards for quality assurance for crime scene investigators, DNA laboratories, and analysts. But the report also raised questions about statistical procedures and sample populations used to interpret the strength of DNA identifications.

In 1993, the NRC revisited forensic DNA testing and published the report, *The Evaluation of DNA Evidence*,¹ in 1996. This second study had a statistically sound sample of DNA data, enabling it to revise the original report’s statistical recommendation and conclude that current genetic statistical analyses to determine individuality are acceptable. More importantly, this second NRC report recommended that, where feasible, DNA evidence samples be divided so that, if there is any question about test results, an ample amount of DNA evidence is available for retesting.

**Standards**

Standard methodology and procedures are essential for any forensic science, especially DNA analysis, where techniques are still developing and contamination is so destructive. Standards for DNA typing were initiated in 1989 by NIJ in an agreement with the Office of Law Enforcement Standards (OLES) at the National Institute of Standards and Technology (NIST). Both RFLP- and PCR-based DNA profiling can be calibrated and quality assurance performed to guard against procedural errors with NIST’s testing kits, SRM 2390 and SRM 2391. Testing kit SRM 2392 currently is being evaluated for mitochondrial DNA (mtDNA) profiling. Other standards for performing DNA testing, including the selection of markers, the number of tests required, and what procedures should be followed, have been developed through the Technical Working Group on DNA Analysis Methods (TWGDAM), which includes representatives from OLES and State and Federal crime labs.

The FBI DNA Advisory Board is charged with developing and recommending standards for quality assurance, including certification of analysts. State and local criminalists created the American Board of Criminalists (ABC) to provide certification. NIJ funded ABC to develop certification for DNA analysts and other forensic scientists. The ABC now certifies criminalists in DNA analysis and drug, fire debris, hair, fiber, paint, and polymer analysis. This provides another level of assurance to prosecutors, defense attorneys, and juries that DNA tests are being conducted accurately.

**Mitochondrial DNA**

Over the last few years a type of DNA called mitochondrial DNA (mtDNA)¹ has become more widely used in criminal investigations. MtDNA is abundant in all cells, including cells attached to hair and semen cells, so it is most useful in cases where there is only a small amount of cellular material. Since mtDNA is present in great quantities, division of samples for retesting is easy. Each individual receives mtDNA only from the mother and shares this with other siblings, so mtDNA is an important means of identifying the mother-child and sibling relationship.

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¹ Available from National Academy Press, 2101 Constitution Avenue NW., Washington, DC 20418.
In 1993 the Lawrence Livermore National Laboratory (LLNL) Forensic Science Center used forensic mtDNA technology to bring closure to a 7-year-old murder investigation. Working in conjunction with the California State Department of Justice Laboratory in Berkeley, LLNL scientists performed 6 months of DNA analyses on the deteriorated bone tissue of an infant girl who had washed ashore in Tiburon, California, in 1988. Known previously as “Baby Jane Doe,” the infant was linked to her murdered mother, who was identified via dental records in March 1992. The two females had disappeared in 1986 and their murdered bodies were found within months of one another in 1988.

Studies determined that the mother and the infant were killed most likely in 1986, and their bodies frozen in a home freezer for approximately 21 months before disposition occurred. The husband, the primary suspect in the murders, committed suicide before detectives could gather enough evidence to obtain an arrest warrant. Identifying the two bodies was the closest investigators would come to solving the case.

Recently, mitochondrial DNA analysis has been accepted as scientific evidence in courts. The current methods of testing mtDNA involve sequencing and are very time consuming. NIJ has funded Dr. Rebecca Reynolds of the Children’s Hospital at Oakland Research Institute to develop a mitochondrial DNA testing kit that will significantly reduce the amount of time needed for performing this kind of DNA analysis.

Also under a grant from NIJ, The American University in Washington, D.C., is studying the application of peptide nucleic acid probes (PNAs) to rapid screening of mtDNA by matrix-assisted laser desorption/ionization time-of-flight mass spectrometry (MALDI-TOFMS). This procedure represents a powerful alternative to traditional methods since the DNA fragments can be separated and detected in seconds, rather than in hours with traditional methods.

Population Data
All statistical approaches that have been developed for determining the uniqueness of a set of DNA markers require sufficient population data. Adequate population data became available through the work of the FBI and an NIJ grant with the University of Texas Health Sciences Center. Dr. Ranajit Chakraborty established a baseline for the sample size required for different racial or ethnic populations. He further developed a statistical method for computing the probability of a DNA match for RFLP tests, and automated the statistical method in software that runs on a desktop computer. Currently, with NIJ support, Dr. Chakraborty is developing and automating a statistical method for computing the probability of a DNA match for PCR tests.

Along these same lines, NIJ has supported Dr. Bruce Weir of North Carolina State University to further refine the statistical analysis of individuation based on DNA testing. In the same vein, NIJ is funding Pennsylvania State University’s Dr. Mark Stoneking to develop population databases for mitochondrial DNA. Because it is only inherited through the mother, the use of mtDNA required additional statistical models.

Other areas of basic research that NIJ has supported include capillary electrophoresis and short tandem repeats (STRs). Using capillary electrophoresis in the DNA PCR testing approach allows the analyst to process multiple markers simultaneously, which accelerates testing. NIJ has funded Dr. Ralph Allen of the University of Virginia and Dr. George Sensabaugh of the University of California–Berkeley to help perfect the capillary electrophoresis technology. TWGDAM recently decided that short tandem repeat (STR) markers in DNA will be the standard markers for PCR testing. STRs were developed through a grant from NIJ to Baylor University under the direction of Dr. Thomas Caskey.

DNA Evidence in the Courtroom
The rapidity with which DNA innovations occur and the scientific training required to understand them fully converge to challenge attorneys’ ability to use the scientific evidence convincingly in court. NIJ provided seed money to the American Prosecutors Research Institute for training seminars to help prosecutors keep pace with DNA issues and present the evidence through direct and cross-examinations with confidence. NIJ also has funded efforts that are extremely helpful to defense attorneys.

At the request of Attorney General Janet Reno, NIJ’s Office of Science and Technology and the Institute of Law and Justice (ILJ) compiled a report, Convicted by Juries, Exonerated by Science: Case Studies in the Use of DNA Evidence To Establish
Innocence After Trial, outlining cases in which DNA testing was used to exonerate convicted felons. The cases in the joint study are similar in that they were all sexual assaults with male perpetrators and female victims; the defendants were all identified by a witness as being the accused perpetrator; and the investigations used non-DNA evidence that did not pinpoint the defendant, but simply narrowed the field of suspects. Each defendant obtained a court order to release evidence for testing against a current sample, and each was set free. The average time served for a crime not committed was 7 years.

Most of the information on the 28 cases examined in the report was provided by the Innocence Project, an organization that helps convicted felons obtain DNA samples for determining guilt or innocence in their particular cases.

To obtain a copy of the report, contact the National Criminal Justice Reference Service (NCJRS) at 800-851-3420 or send an e-mail to askncjrs@ncjrs.org. Electronic copies can be downloaded from the Justice Information Center World Wide Web site: http://www.ncjrs.org.

National Commission on the Future of DNA Evidence

Under the charter signed in August 1997 by Attorney General Janet Reno, NIJ is establishing a National Commission on the Future of DNA Evidence to consider the implications of recent advances in DNA science for the operations of the criminal justice system, from crime scene to jury trial. The National Commission will consist of a broad range of policymakers and authorities concerned with the use of DNA evidence in criminal cases, including judges, prosecutors and defense attorneys, law enforcement personnel, and forensic scientists. Commission members will be charged with reviewing critical policy issues involved in the development and use of DNA technologies.

Five-Year DNA R&D Program

NIJ has launched a 5-year, national DNA program to develop rapid, reliable, inexpensive, portable DNA tests. We look toward the day when DNA testing can be so automated that it can be conducted at the crime scene, with no doubts about reliability, with no delays, and with no hesitation about excessive costs.

NIJ is funding DNA research and development (R&D) projects in two important areas: microchip technology and mass spectrometry.

Microchip technology. Technology has been developed at Nanogen, Inc., of San Diego, California, that allows the rapid transport, concentration, hybridization, and analysis of DNA using electric fields on a silicon microchip. Under the direction of Dr. Michael Nerenberg, and through a grant from NIJ, Nanogen will apply this silicon microchip technology to analyze the number of DNA tandem repeats from individuals to determine genetic identity from tissue samples. This technology will allow greater than 99 percent probability of identity. Simultaneous analysis and comparison of two individuals using two colors on one chip is also possible. This research is intended to accelerate development of the final product, a fully integrated system.
in which crude tissue will be added, almost instantly generating genetic information with minimal operator intervention. The device will be cheaper, more rapid, and less difficult to operate than current methods, and its portability should allow it to be operated closer to the point of evidence collection. Under an Interagency Agreement with the U.S. Department of Energy (DOE), NIJ is funding Lockheed Martin Energy Research at Oak Ridge National Laboratory in a project headed by Dr. J. Michael Ramsey to develop another type of disposable microchip device capable of carrying out all sample processing and analytical steps. Blood or other biological samples could be collected directly into the device, which could then be sealed for transport and analysis, eliminating post-collection handling and exposure of samples. Ultimately, such miniature devices could be used for DNA testing at the crime scene.

**Mass spectrometry.** Led by Dr. Christopher Becker, GeneTrace Systems, Inc., of Menlo Park, California, is developing a highly automated instrument for human identification using DNA markers called STRs. The system will consist of a mass spectrometer plus a multi-tip pipetting robot. Using mass spectrometry to achieve a faster, more efficient, and less expensive analytical technique than is currently available, system throughput could be as high as several thousand individuals typed per day, per instrument, allowing significant cost savings in labor.

Laser desorption mass spectrometry (LDMS) DNA typing also can allow analysis time to be reduced to less than 5 minutes per sample, compared to hours with conventional methods, and is also suitable for robotic automation. Under an Interagency Agreement with DOE, NIJ is funding Lockheed Martin Energy Research at Oak Ridge National Laboratory to develop rapid DNA typing technology using LDMS. Under the direction of Dr. C.H. Winston Chen, resolution and detection sensitivity of large DNA molecules will be improved to enable routine analysis of STRs for DNA profiling.

**Looking to the Future**

In June 1996, NIJ held its first National Conference on the Future of DNA: Implications for the Criminal Justice System to examine the impact of DNA testing on the criminal justice system (police, judiciary, prosecution, and defense). One speaker, Lt. Diana Sievers of the Illinois State Police, described how she trains investigators to collect evidence and how this training is informed by the need to cooperate with crime lab analysts. In some jurisdictions, officers are tested on their ability to collect evidence, and this trend may eventually require officers to have certification before they are allowed to collect evidence.

Other conference topics included quality assurance for laboratory performance and establishment of State DNA databases that feed into the FBI’s CODIS network. CODIS stores and indexes DNA samples from convicted offenders, cases in which forensic DNA evidence is involved, and the general population.

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2 A limited number of copies of a summary videotape of the conference are available from the National Law Enforcement and Corrections Technology Center, 800-248-2742. The conference report is available from the Institute for Law and Justice, 703-684-5300.
A Second National Conference on the Future of DNA: Implications for the Criminal Justice System was held in June 1997 and a third is planned for 1998. The focus has grown to include case study discussion and scientific presentations on emerging technologies.

**Medicolegal Death Investigation**

Another area where standardization of procedures is crucial is death investigation. NIJ was approached by the medicolegal profession to develop guidelines for death investigation and criteria for training death investigators and subsequently awarded a grant to Occupational Research and Assessment, Inc., of Big Rapids, Michigan, to accomplish this. Under the direction of Dr. Steven C. Clark, the study has produced a set of national guidelines that have been approved by the National Medicolegal Review Panel and an interactive CD-ROM training disk that should be available to law enforcement and laboratory personnel in the near future.

As with DNA analysis, medicolegal death investigation requires standardization of procedures, proper evaluation of conclusions, and qualified investigators to interpret crime scene data. One of the most important qualifications is the ability to know when to be suspicious about a death.

At a 1996 professional conference, John H. Trestail III, a pharmacist, spoke about the difficulty of detecting poisons for medicolegal investigators who are not very knowledgeable about pharmaceutical effects of drugs and other toxic substances. As Trestail explains in his poem, *The Poisoner*,

*The body lies there neat and clean,  
  as the cause of death is seldom seen.  
  And the coroner may take time to pause—  
  “Is this death due to a natural cause?”*

In 1995, Dr. Barry K. Logan of the Washington State Toxicology Laboratory completed an NIJ-funded study of postmortem detection of carbon monoxide and cyanide. Logan improved the gas phase electrochemical method of detecting these poisons so that detection is quicker, more sensitive, and more widely applicable than previously possible.

Another essential ability for the medicolegal professional is determining the time of death. As the time between death and discovery of the corpse (known as the postmortem interval) grows longer, the accuracy of determining the time of death grows weaker. Typically, pig corpses are used as surrogates for human corpses, and the time of death calculated by investigating the time at which different insect species are found on the corpse.

While the life cycle of different insect species is well documented and a reliable technique for determining passage of time, the use of this technique in comparing the life cycle of insects on pig corpses to the life cycle of insects on human corpses could easily be questioned. NIJ funded a study that compares the entomological population on pig and human corpses through the Louisiana Technical University with Dr. Neal H. Haskell of Indiana and Dr. Robert D. Hall of the University of Missouri–Columbia as principal investigators. The researchers found a correlation between the two groups, but the samples were not adequate to provide a complete finding. Dr. Haskell is continuing the project for NIJ through the University of Indianapolis with the aim of providing a satisfactory test sample, using pig corpses of larger and varying sizes more comparable to humans.

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Under NIJ’s charter, relative to its grants program, NIJ is authorized to:

- Sponsor research and development to improve and strengthen the Nation’s system of justice with a balanced program of basic and applied research.
- Evaluate the effectiveness of criminal justice and law enforcement programs and identify those that merit application elsewhere.
- Support technological advances applicable to criminal justice.
- Test and demonstrate new and improved approaches to strengthen the justice system.
- Disseminate information from research, development, demonstrations, and evaluations.
Other Forensic Sciences

Although other forensic sciences such as fingerprint identification, voice identification, questioned document examination, trace evidence, and firearms identification have not received the recent national attention and scrutiny that DNA has, forensic scientists in all branches have realized that all the various disciplines involved in crime-solving must be able to withstand the stringent challenges of evidentiary rules and cross-examination. NIJ continues to support projects that develop the scientific basis of forensic techniques, advance the reliability or safety of forensic techniques, or bring established sciences to bear on forensic problems in new ways.

Latent Fingerprints

Latent fingerprints, which are prints taken off objects at a crime scene and the most difficult type of prints to locate, are readily retrieved today thanks to a one-step process developed by David Weaver, formerly of the Alaska Scientific Crime Detection Laboratory and the 3M Company, with funding from NIJ. Going from concept to product in 18 months with a research and development investment of $96,000, the fingerprint-retrieving device consists of a vapor wand fitted with a rechargeable cartridge of a cured substance called cyanoacrylate, impregnated with an ultraviolet dye. Once ignited, the cyanoacrylate emits fumes that tag fingerprints consistently on all nonporous surfaces in about 20 seconds. Large crime scenes, such as an entire house, can be processed in 1 to 2 hours via a vapor pump that is controlled from outside the crime scene. Cyanoacrylate fuming greatly enhances the investigator’s ability to process prints quickly at the scene, thereby guarding against their further degradation en route to the laboratory. Cyanoacrylate fingerprint wands are now being manufactured by several companies.

While this effort was underway, NIJ supported Dr. Madeleine M. Joullie’s research at the University of Pennsylvania for development of new reagents for capturing latent fingerprints. The research resulted in 21 new ninhydrin analogs that can work with nonchlorofluorocarbon solvents; thus, there are now choices for latent print development that can be extremely sensitive to the materials on which the prints are developed and to the environment as well.

Ninhydrin, a crystalline oxidizing agent, has long been regarded as one of the most effective and affordable reagents for visualization of latent fingerprints on porous surfaces. NIJ-sponsored research has discovered that ninhydrin can be synthesized into various analogs (chemical compounds that are structurally similar to others but differ slightly in composition) that display fingerprint development qualities superior to the compound’s own, including brighter fluorescence and better line resolution. Ninhydrin derivatives have solved the problem of finding solvent substitutes for chlorofluorocarbons (banned by the Environmental Protection Agency), since they are quite soluble in organic solvents. One of the new analogs is being mass produced in Ireland to test its potential for commercial use.

Questioned Document Examination

Dr. Carole E. Chaski, an NIJ visiting fellow, is conducting research on questioned document examination. Before coming to NIJ, Dr. Chaski taught graduate and undergraduate linguistics and consulted in homicide and solicitation to murder trials. Dr. Chaski is bringing her training in linguistic theory to bear on the problem of identifying the
Rather than focusing on handwriting, Dr. Chaski is analyzing the language patterns in the document, including vocabulary, phrase structure, and sentential syntax, and developing computer software to perform these analyses, quantify the results, and compare documents statistically.

Traditional methods of questioned document examination are currently under fire, since a Federal judge’s ruling that the methods are not reliable nor based in science. As a result of this ruling and subsequent cases, NIJ was approached by the American Society of Crime Laboratory Directors (ASCLD) to help determine what could be done to strengthen the scientific basis for handwriting identification. Dr. Chaski has been helping NIJ resolve the issues brought about by this case, and has worked with professional questioned document examiners to organize a workshop on the issues. The workshop, held in July 1996, brought together practitioners and scholars from neuroscience, computer science, statistics, and the legal community. A second successful workshop was held in December 1996, prompting the FBI to form the Technical Working Group for Documents (TWGDOC) in the spring of 1997, in which NIJ staff currently participate.

**Trace Evidence and Firearms Examination**

NIJ has supported and is supporting numerous projects in the area of trace evidence. At DOE’s Oak Ridge National Laboratory, Dr. Michael E. Sigman is developing new materials and methods for the sampling and analysis of explosives trace chemical evidence and Dr. Douglas C. Duckworth is developing and demonstrating an inductively coupled plasma mass spectrometry procedure for discrimination of glasses. At Idaho National Engineering Laboratory, Dr. Gary S. Groenewold is conducting a study to apply and evaluate static secondary ion mass spectrometry (SIMS) analysis for chemical characterization of manmade fibers and paint coatings. Under an NIJ grant to the University of South Carolina, Dr. Stephen L. Morgan will develop and validate forensic analytical methods using pyrolysis gas chromatography/mass spectrometry coupled with chemometric data analysis for the examination of copier or laser toners, automobile paints, and adhesive materials.

At Sandia National Laboratories, Dr. David R. Sandison is developing a new set of fluorescence imaging tools (FITS) for crime scene investigation, forensic medical examinations, fingerprint analysis, and materials identification. These tools can detect fluorescent evidence under normal lighting conditions and are faster and more accurate than current techniques.

NIJ has supported two different approaches to gunshot residue analysis. Dr. Peter DeForest’s work developed techniques of fluorescence spray labeling that are preserved photographically to demonstrate the presence of gunshot residue and its spatial relationship to its surroundings at the time it was produced. Dr. David Stoney developed and constructed an electron microprobe that will work on the stage of a light microscope to detect the elemental composition of trace evidence.

OLES is working to assist the FBI and the Bureau of Alcohol, Tobacco and Firearms bring about compatibility of their two weapons identification systems and integrate the technologies for State and local use. Currently, the two different weapon identification technologies focus on differing aspects of the firearm, one on cartridge identification, the other on bullet identification. Crime scenes may require one or the other, or both types of identification.
The scratches made on a bullet by a gun barrel when the bullet is fired, known as striations, create a unique “signature” that can be matched with other bullets fired from the same gun. NIJ is funding Intelligent Automation, Inc., of Rockville, Maryland, to develop an approach for capturing this three-dimensional data from a bullet’s surface, using a structure similar to an atomic force microscope, for use in an automatic weapons identification system.

Additionally, NIJ has awarded a grant to the Association of Firearm & Toolmark Examiners to develop written and practical certification exams for practicing firearms examiners.

NIJ also funded Dr. John Thornton at the University of California–Berkeley to develop a computerized hypertext sourcebook of forensic science information, including serology, firearms, fingerprints, and trace evidence. This computer sourcebook will be available on CD-ROM and allow a library of information to be available rapidly, conveniently, and inexpensively.

National Center for Forensic Science

NIJ has funded the establishment of a National Center for Forensic Science (NCFS) at the University of Central Florida (UCF) in Orlando under the direction of Dr. William McGee. Established as a forensic laboratory facility, the Center’s activities focus on arson and explosion research, training support, and technical assistance for law enforcement agencies and laboratory analysts. UCF has coordinated with forensic specialists from the FBI and the Bureau of Alcohol, Tobacco and Firearms in planning NCFS activities that will complement the ongoing initiatives of these agencies and avoid duplication of effort. The Center was formally introduced to the law enforcement community at the Law Enforcement and Corrections Technology Advisory Council meeting on May 19, 1997, in Orlando, Florida.

Lab Design

With the implementation of NIJ’s DNA Laboratory Improvement Program, crime labs across the Nation have begun to request assistance from ASCLD on how to design new crime labs or expand and upgrade existing labs to meet various standards for performing their analyses.

NIJ was approached by ASCLD to help develop guidelines for the architectural and engineering design of crime labs. Design issues include safety, hazardous materials, security in the chain of custody, preservation of evidence in an uncontaminated state, as well as budgetary concerns. NIJ, OLES, and ASCLD held a joint design and development workshop in November 1996 to develop guidelines and recommendations for planning and designing forensic laboratories. As a result of this collaboration, NIJ has published a detailed report titled Forensic Laboratories: Handbook for Facility Planning, Design, Construction, and Moving (NCJ 168106).3

3 The report is available from the National Criminal Justice Reference Service, 800–851–3420.
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