



STRENGTHENING FORENSIC SCIENCE: A PROGRESS REPORT

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Science and technology are essential to the pursuit of justice and are critical to the appropriate collection, assessment, and application of evidence in the criminal justice system. To ensure that the best forensic science is brought to bear in the pursuit of justice, the Administration has from its earliest days supported a wide range of research and policy activities. This document highlights a number of accomplishments to date,¹ focusing primarily on activities carried out by the Department of Justice and several of its components including the National Institute of Justice (NIJ), Drug Enforcement Administration (DEA), Bureau of Alcohol, Tobacco, Firearms, and Explosives (ATF), and Federal Bureau of Investigation (FBI); the Commerce Department's National Institute of Standards and Technology (NIST); and the National Science Foundation (NSF), as well as several multiagency efforts, including some in coordination with the White House Office of Science and Technology Policy (OSTP) and other White House offices.²

Strengthening forensic science is a complicated challenge that will require considerably more work and a sustained commitment on the part of the Federal Government as well as the broader forensic science community. This document will be updated periodically to reflect the Administration's continued progress in this area.

I. Federally Sponsored Forensic Science Research

- Since 2009, NIJ has provided more than \$100 million to fund more than 250 research and development projects related to forensic science, resulting in more than 600 scientific publications, presentations, and final technical reports listed in the [National Criminal Justice Reference Service](#). NIJ's forensic science research portfolio is managed by a core

¹ *This document is not intended to be exhaustive and does not include forensic science activities relating to anti-terrorism activities such as those largely coordinated by the Department of Defense and the Department of Homeland Security, or the domain of digital forensics.*

² *Other Federal departments and agencies that have engaged in efforts to strengthen the forensic sciences include: Department of Defense; Department of Health and Human Services; Department of Homeland Security; Department of the Interior; Department of Treasury; Environmental Protection Agency; National Institutes of Health; National Transportation Safety Board; Smithsonian Institution; United States Postal Service; and the Intelligence Community.*

team of scientists with expertise in a diverse array of forensics-relevant fields, including toxicology, biology, genetics, anthropology, document analysis, and chemistry.

- In 2009 and 2010, NIJ issued a solicitation entitled *Fundamental Research to Improve Understanding of the Accuracy, Reliability, and Measurement Validity of Forensic Science Disciplines*, which sought applications for funding focused on expanding the scientific basis of forensic methods, developing quantifiable measures of the reliability and accuracy of forensic analyses, and developing an understanding of human factors that may affect forensic analyses—concordant with a number of priorities identified by the National Academy of Sciences in its 2009 report, *Strengthening Forensic Science in the United States: A Path Forward* (“NAS report”). Further, in 2011, 2012, and 2013 NIJ issued two other core solicitations: *Basic Scientific Research to Support Forensic Science for Criminal Justice Purposes* and *Applied Research and Development in Forensic Science for Criminal Justice Purposes*. The Basic Scientific Research program encompasses the physical, life, and cognitive sciences and is designed to increase knowledge underlying forensic science disciplines that are used in the Nation’s criminal justice system. The Applied Scientific Research program is dedicated to the development of highly discriminating, accurate, reliable, cost-effective and rapid methods for identifying, analyzing and interpreting physical evidence.
- In August 2013, NSF issued a public [“Dear Colleague Letter”](#) announcing NSF’s interest in receiving proposals in any directorate across the Foundation that address fundamental research questions with the potential to advance the forensic sciences. As part of its effort to expand support for forensics-related fundamental research, NSF has conducted a number of outreach efforts both within NSF (to familiarize Division leaders with forensics challenges that may be relevant to their portfolios) and outside of NSF (for example, notifying forensic science professional organizations of NSF’s interest in this area).
- A recent scan of abstracts and titles in NSF’s public awards database indicates that NSF is currently funding nearly 200 research projects with relevance to the forensic sciences, including studies on bias in lie detection, digital forensics, measurement science as it pertains to organic-compound standards setting, and skeletal biology. Most of these projects have an education component, and many have a focus on education.
- In the last five years, the FBI Laboratory has conducted research on a wide range of topics—including friction ridge analysis, microbial forensics, the physical and chemical characteristics of improvised explosives, drug-facilitated sexual assault cases, and rapid DNA technology—resulting in a number of influential scientific publications. For example, the FBI Laboratory’s research on friction ridge analysis resulted in two seminal

publications – “[A Study of the Accuracy and Reliability of Forensic Latent Fingerprint Examiners](#)” (*Proceedings of the National Academy of Sciences*, 2011) and “[Repeatability and Reproducibility of Decisions by Latent Fingerprint Examiners](#)” (*PLoSOne*. 2012).

- From 2009 to 2014, NIST’s [Applied Genetics Human Identity Team](#) published 81 papers on various aspects of using genetic markers for human identification and gave 327 presentations to the forensic DNA community including more than two dozen training workshops.
- From 2009 to 2014, NIST’s Forensic Toolmark Analysis Project Team published 22 papers, executed 4 workshops, and delivered 47 presentations related to developing standards and more objective measurement techniques in firearm and toolmark analysis.
- Since 2009, ATF has supported research and development related to forensic science resulting in more than 34 peer reviewed scientific publications and numerous presentations at scientific venues.

II. Development of Standards, Guidelines and Best Practices

- The interagency National Science and Technology Council (NSTC) Subcommittee on Forensic Science (SoFS), established by OSTP, assessed a number of the challenges and opportunities facing the U.S. forensic science community and considered potential paths forward for a number of the issues raised by the NAS report. The Subcommittee’s activities were coordinated through five interagency working groups that together involved the participation of 23 Federal departments and agencies as well as state and local government partners. OSTP is currently finalizing for public release a number of the Subcommittee’s draft work products in the form of white papers on topics including accreditation, certification, professional ethics, proficiency testing, medicolegal death investigation, and standardization of reporting.
- In February 2013, DOJ and NIST announced a new initiative to accelerate efforts to strengthen forensic science through the development of improved standards. Under the initiative, discipline-specific Scientific Working Groups (SWGs), most of which were formerly overseen by DOJ components, will be reorganized and strengthened under NIST oversight.
- In addition, DOJ and NIST have created a new Federal Advisory Committee (the National Commission on Forensic Science) that will work to improve the practice of forensic science by developing guidance and policy recommendations for the U.S. Attorney General. The inaugural members of the commission were announced in January 2014.

Under this Administration, a number of interdisciplinary working groups have been launched to produce technical publications and other forms of critical guidance for the forensic science community. Examples of work products include:

- In 2010 and 2011, NIJ and FBI created three new SWGs to develop and coordinate best practices in the areas of [medicolegal death investigation](#), [forensic toxicology](#), and [disaster victim identification](#).
- The Scientific Working Group for the Analysis of Seized Drugs (SWGDRUG), founded and funded by the DEA, developed a series of standards that establish a minimum basis of practice for the validation and sampling of seized drugs. Several of SWGDRUG's standards have been made into ASTM International Standards and are serving as guides for laboratories around the world. Since 2009, ASTM has revised or adopted standards relating to: [education and training \(E2326\)](#); [quality assurance \(E2327\)](#); [identification \(E2329\)](#); [sampling \(E2548\)](#); [validation \(E2549\)](#); [uncertainty \(E2764\)](#); and [clandestine laboratories \(E2882\)](#).
- In February 2012, the NIJ/NIST-led Expert Working Group on Human Factors in Latent Print Analysis released a report, [Latent Print Examination and Human Factors: Improving the Practice through a Systems Approach](#), with detailed recommendations for improving quality and reducing the risk of error in latent-print analysis and reporting. The publication includes a Latent Print Process Map that diagrams examiners' workflow to highlight points throughout the examination process where opportunities for error—as well as opportunities for preventing and correcting error—arise.
- The NIJ/NIST-led [Latent Print AFIS Interoperability Working Group](#) has produced a number of publications to support state and local agencies in sharing fingerprint information across jurisdictions, including: [Writing Guidelines to Develop a Memorandum of Understanding for Interoperable Automated Fingerprint Identification Systems](#); [Latent Interoperability Transmission Specification](#); and [Markup Instructions for Extended Friction Ridge Features](#).
- In April 2013, the NIJ/NIST-led Technical Working Group for Biological Evidence Preservation released [The Biological Evidence Preservation Handbook: Best Practices for Evidence Handlers](#). This document provides best practices and guidance to ensure the integrity, prevent the loss, and reduce the premature destruction of biological evidence after collection through post-conviction proceedings.
- In June 2013, the NIJ/NIST-led Working Group on Forensic Science Laboratories created a [Handbook for Facility Planning, Design, Construction and Relocation](#), a resource for laboratory directors, designers, consultants, and other stakeholders involved in the construction or major renovation of forensic laboratories.

- In September 2013, the National Forensic Science Technology Center (NFSTC), a 501(c)(3) not-for-profit organization, collaborated with DOJ's Bureau of Justice Assistance (BJA), NIST, and NIJ to publish an updated edition of [*Crime Scene Investigation: A Guide for Law Enforcement*](#), which provides crime scene response and prioritization guidelines, crime scene documentation and evaluation processes, and collection guidelines for specific evidence types.
- The NIJ/NIST Working Group on Presenting Forensic Science Evidence Using Quantitative and Qualitative Terms (QQWG) is currently developing recommendations for reporting conclusions of forensic examinations, an important step in the process of standardizing and optimizing the presentation of quantitative and qualitative forensic science evidence to law enforcement and jurors.
- In 2011, NIST conducted a review and evaluation of the accuracy of commercially available photo scales used in forensic laboratories and at crime scenes across the country. Photo scales are references used in the documentation of photographic evidence, allowing investigators to reconstruct the dimensional context of a scene. The [study](#) found a lack of consistency in product quality and accuracy and suggested pathways for establishing standards for forensic photo scales to help ensure accuracy and user confidence.

III. Strengthening the Federal Research Agenda

- In the spring of 2013, OSTP created and filled the new position of Assistant Director for Forensic Science, under whose leadership—in consultation with NIST, DOJ, and NSF—OSTP has begun work toward the development of a National Research Strategy for Forensic Science. This ongoing effort aims to: (1) identify the most important knowledge gaps to help direct research efforts and priorities; (2) coordinate and streamline research efforts across Federal funding entities; and (3) foster collaboration between academic researchers and forensic practitioners. Strategies for achieving these goals include: a thorough review and analysis of the current Federal forensic science research portfolio, including an analysis of the nearly 600 active Federal research projects identified in 2012 by the Research, Development, Training and Education Interagency Working Group of the NSTC Subcommittee on Forensic Science to identify gaps and overlap; the creation of one or more multidisciplinary forensic science research centers; and the use of incentive prizes to address specific challenges.
- Last year, to plan strategically for technological and research needs in the near- and long-term, the FBI Laboratory convened laboratory personnel to conduct a Gap Analysis and Prioritization Workshop, results of which were used by executive management for funding decisions and prioritization of research.

- In recent years NIJ has made several improvements to its National Archive of Criminal Justice Data (NACJD) and the National Criminal Justice Reference Service (NCJRS), including improved data archiving, enhanced tracking of grantee products, and increased transparency through the provision of online access to abstracts and final technical reports.
- In September 2012, NSF and NIJ signed a Memorandum of Understanding (MOU) that is leveraging each agency's strengths and resources and promoting collaboration through the co-review of proposals and other interagency activities.
- NSF implemented advanced text mining analytics to develop a picture of NSF support for forensics-related basic research and to assess links between NSF-supported basic research and more applied forensic research supported by NIJ. NSF has also created a Program Reference Code to facilitate identification of forensics-related research in future awards.

IV. Strengthening Scientific Capacity

- DOJ's Office of Justice Programs (OJP) established a Science Advisory Board comprising 18 highly regarded university-affiliated research scientists and practitioners. The NIJ Subcommittee of the Science Advisory Board has conducted a review of NIJ's physical science and technology portfolio and will review NIJ's forensic science program in 2014. NIJ has factored the Advisory Board's recommendations into the development of NIJ's research agenda, its engagement with the scientific community, and its dissemination of results to practitioners to enhance the impact of NIJ-funded research in the forensic science community.
- In 2011, NIJ awarded a grant to RTI International (RTI) and its partners – Duquesne University, the University of North Texas Health Science Center, and Virginia Commonwealth University – to establish the Forensic Science Technology Center of Excellence (FTCoE). The FTCoE provides testing, evaluation, technology transition assistance, training and outreach, and other services for use by the forensic science community to help effectively transition emerging forensic technologies into the field. All of the Center's activities are designed to support activities that are intended for use by crime laboratories, forensic service providers (supporting criminal justice applications), law enforcement and other criminal justice agencies to combat crime.
- NIJ bolstered its peer-review process by instituting [Standing Scientific Review Panels \(SRPs\)](#), which have enhanced the quality and breadth of the NIJ grant-review process. In fiscal year 2012, NIJ invited SRP members to serve for two years with an option to serve for a third. NIJ plans to add new members each year so panelists serve overlapping three-

year terms—an approach that will help maintain greater consistency from year to year. Additionally, a new scoring procedure used by the SRPs brings greater transparency to the peer-review process.

- In 2012, the FBI Laboratory created a Research Review Team to enhance its evaluation of research project ideas, prioritize research, ensure suitable deliverables are established in research plans, encourage use of project managers to facilitate project efficiency, oversee financial and personnel obligations on research projects, and conduct frequent progress reviews of all research projects.
- In 2010, ATF opened its [National Center for Explosives Training and Research \(NCETR\)](#) facility in Huntsville, AL, which includes a modern training and research center and approximately 1,000 acres of explosives ranges to aid in the fight against explosives-related violent crime. ATF, in collaboration with other Federal agencies, has completed several significant forensic science research projects in this domain, including studies on the recovery of DNA and latent prints from explosive devices.
- In 2012 the ATF laboratory system transitioned from its legacy accreditation system to a system based on ISO/IEC17025 international standards. During this accreditation cycle ATF sought and achieved accreditation of the ATF Fire Research Laboratory.

V. New Technology and Tools

- DEA created an Emerging Drug Trends group (EDT) at its Special Testing and Research Laboratory to comprehensively and continuously evaluate and address the creation and distribution of novel psychoactive substances. One of the responsibilities of the EDT group is to synthesize reference standards for some of these new substances and to make them available, at no cost, to law enforcement forensic laboratories for use in their analytic labs. Since the start of the EDT group, DEA has provided in excess of 70 such reference standards to forensic laboratories world-wide.
- The FBI, DOD, and DHS partnered to help drive the development of “point of collection” DNA analysis instruments, which are instruments that could be used to collect and analyze DNA from suspects at arrest and booking. The three agencies agreed on a core set of requirements and jointly funded a development project. Prototypes were delivered in September 2012, and test and evaluation of the prototypes in 2013 resulted in hardware and software improvements. The three agencies participated in a joint study of the technology in 2013, organized by the NIST Applied Genetics Group. Results were promising, and testing will continue in 2014.
- To advance the FBI’s biometric identification services, Next Generation Identification (NGI) was deployed in May 2013 as a replacement of the Integrated Automated Fingerprint Identification System (IAFIS). NGI allows for faster searches with increased

identification accuracy and offers new capabilities to search civil and criminal databases simultaneously.

- NIST has developed or updated a number of standard reference materials for a range of forensic science areas, including DNA analysis, drugs of abuse, blood alcohol, crime-scene investigation, and bullet and cartridge-casing identification.
- NIST also created a number of special databases and computer programs for use by forensic practitioners, including the National Software Reference Library, Mated Fingerprint Card Pairs, a Mugshot Identification Database, the [Consolidated Model of Fire and Smoke Transport \(CFAST\)](#), and a [Fire Dynamics Simulator and Smokeview](#)—as well as a [comprehensive list of relevant databases](#) available for use by forensic science service providers.

VI. Selected Workshops and Symposia

- DNA Technical Leader Summit (November 20-22, 2013): NIST partnered with the FBI CODIS Unit to host a two-day summit focusing on the challenges of interpreting complex DNA mixtures found in casework and of applying appropriate statistical models.
- Measurement Science and Standards in Forensic Handwriting Analysis Conference and Webcast (June 4-5, 2013): NIST partnered with FBI, NIJ, the American Academy of Forensic Sciences, and others to share information on the current state of forensic handwriting analysis.
- Emerging Trends in Synthetic Drugs Workshop (April 30-May 1, 2013): NIST partnered with DEA to host a free, two-day workshop and live webcast exploring emerging trends in the forensic analysis of synthetic cannabinoids, substituted cathinones, and novel hallucinogens.
- DNA Mixture Interpretation Workshop (April 12, 2013): NIST hosted a free, one-day workshop and webcast on interpreting forensic DNA mixtures in casework.
- ANSI/NIST-ITL Standard Workshop 2013 (January 28-30, 2013): NIST hosted a workshop to discuss proposed supplements to the biometric data format standard that supports voice recognition, dental and oral data, disaster-victim identification, and special data needs for mobile ID applications.
- Forensics@NIST 2012 Symposium (November 28-30, 2012): Free symposium featured more than 45 lecture presentations and 40 poster presentations by NIST scientists and their collaborators showcasing cutting-edge forensic science research being performed at NIST.

- Measurement Science and Standards in Forensic Firearms Analysis (July 10-11, 2012): NIST partnered with the Association of Firearm and Tool Mark Examiners and others to host a free, two-day conference and webcast exploring measurement science and standards in the forensic discipline of firearms analysis.
- NSF supported several workshops to promote information exchange and to seed possible research collaborations between forensic scientists and basic research scientists, including:
 - 2010: [Workshop on Cognitive Bias and Forensic Science](#) 2012: Instrumentation Research: [Science on Location: Forensic Science on the Move](#)
 - 2014: [Frontiers in Video and Image Analysis \(in collaboration with FBI, the Defense Advanced Research Projects Agency \(DARPA\), and the University of Maryland\)](#).
- NIJ held the first national [Forensic Death Investigation Symposium \(June 7-9, 2010\)](#), for medical examiners and coroners across the United States.

NIJ and FBI, in coordination with FTCoE, co-sponsored two [Impression and Pattern Evidence Symposia](#), in 2010 and 2012, bringing together practitioners and researchers from disciplines including: Bloodstain Pattern Analysis, Footwear and Tire, Latent Fingerprints, Questioned Documents, and Firearms and Tool Marks.

- NIJ, in coordination with the FBI, held Trace Evidence Symposia in [2009](#) and [2011](#), bringing together practitioners and researchers from the United States and abroad to enhance information-sharing and promote collaboration among the trace evidence, law enforcement, and legal communities.

VII. Education and Training

- NIJ funded an *NIJ-Forensic Sciences Foundation Grant Program*, which provides research grants to students at colleges and universities that are accredited by the Forensic Science Education Programs Accreditation Commission for projects that contribute to improving the analysis of forensic evidence and/or understanding forensic science.
- NIJ also provides grants through [NIJ's Graduate Research Fellowship \(GRF\) program](#), which provides assistance to universities for dissertation research support to outstanding doctoral students undertaking independent research on issues related to crime and justice. NIJ has recently expanded the GRF to provide support across a wider range of social, physical, and forensic sciences. In addition, NIJ restarted its visiting scholar program, through which it hosts forensics scholars from other institutions.

VIII. International Collaborations

- In 2011, the United States and the Netherlands signed an MOU launching a new partnership between the NIJ, the Netherlands Organisation for Scientific Research, and the Netherlands Forensics Institute. The partnership is allowing these three entities to share specialized skills and technologies to improve the application of forensic sciences in the two nations' respective criminal justice systems.
- In 2012, NIJ entered into a new partnership with the Australia-New Zealand Policing Advisory Agency that established a framework for criminal justice forensic communities in the United States and Australia to collaborate on research and development projects and to co-evaluate new forensic technologies.
- In 2012, NIST signed an [MOU](#) with the Netherlands Forensic Institute to facilitate the advancement of technologies, methods, practices and standards in the field.

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