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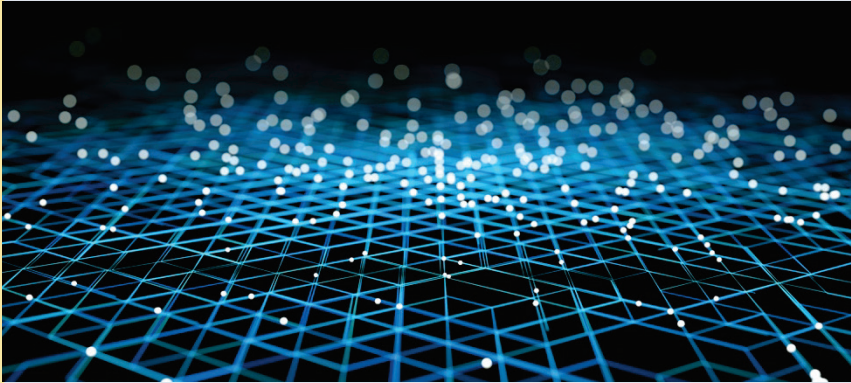A program of the National Institute of Justice

IN-BRIEF

The NIJ Forensic Laboratory Needs Technology Working Group—Progress to Date and Future Plans

"One of my top priorities for NIJ is to ensure that research informs improvements in practice in the field. The work of this group embodies that goal and is critical to the advancement of forensic science."

— Nancy La Vigne, PhD
NIJ Director

Introduction

Recognizing the many challenges associated with adopting new technologies and other innovations in forensic science organizations, the National Institute of Justice (NIJ) established the Forensic Laboratory Needs Technology Working Group (FLN-TWG) in 2018. The FLN-TWG provides a forum in which forensic practitioners and researchers can work together to solve specific, important, operational, and implementation challenges for the community. Housed at NIJ and supported by the Forensic Technology Center of Excellence (FTCoE), the FLN-TWG is comprised of crime laboratory directors, managers and academic researchers who meet regularly to share ideas, assess the impact of new technologies on the criminal justice system, and identify paths forward for implementation. The group's mandate encompasses the full range of needs facing federal, state, local, and tribal jurisdictions. The FLN-TWG is designed to clear roadblocks that have prevented broad, successful adoption of promising technologies and provides objective expertise to ensure that research and implementation of technology is responsive to the operational needs of the forensic science community. Since its establishment, the FLN-TWG has convened biannually with regular communication between meetings to discuss emerging issues. The FLN-TWG compliments NIJ's existing Forensic Science Technology Working Group (FS-TWG), which is comprised of bench scientists, and the Council of Federal Forensic Laboratory Directors (CFFLD), which is comprised of representatives from the Department of Justice (DOJ) and other agencies of the executive branch that have forensic science laboratories. Unlike the FLN-TWG, the FS-TWG focuses on identifying and prioritizing operational research and development needs and CFFLD works at the federal level to identify trends, share intelligence, determine research needs, and encourage collaborative ways to use forensic science in the fight against crime.

Objectives

► Introduce the FLN-TWG and its functions to the forensic community.

► Summarize the FLN-TWG's progress and outputs.

► Inform the community of upcoming FLN-TWG deliverables.

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What are the Goals and Objectives of the FLN-TWG?

Implementing new technologies into forensic laboratories plays a major role in the continuous improvement of forensic science. NIJ has invested heavily in scientific research and development (R&D) related to the forensic science disciplines resulting in many successes related to these efforts ranging from operational improvements to laboratory techniques. Technologies that provide value to the forensic community must address practitioner needs in a manner that equally prioritizes improving efficiency with maintaining quality. In many cases, additional work is needed to adopt new approaches into practice and educate forensic science professionals about best practices to maximize impact. The FLN-TWG collaborates with NIJ, FTCoE, and forensic science organizations to guide the community across those implementation hurdles.

The FLN-TWG was created pursuant to 6 U.S.C. § 162(b)(2) and intended to identify and address the forensic technology needs of federal, state, local, and tribal law enforcement agencies. Through this working group, the NIJ intends to accomplish the following goals and objectives:

1. Identify the needs and operational requirements of forensic laboratories when implementing technologies used in investigative and forensic science applications.
2. Assess how new technologies, methods, and practices affect state, local, and tribal law enforcement and crime laboratories.
3. Evaluate newly developed technologies for operational readiness to provide advice on federal, state, local, and tribal priorities and implementation strategies.
4. Assess and support implementation of promising research, technologies, and practices and advance systems-based strategies in response to technological needs.

The FLN-TWG focuses on the transition of scientific research and evidence-based innovation into operational forensic improvements that produce measurable impacts in forensic science organizations. This group supports NIJ's mission to help ensure that forensic research is relevant and responsive to the technology needs of forensic practitioners.

Who Makes up the FLN-TWG?

Members were selected to achieve a diverse balance of backgrounds, experience, expertise (professional and scientific), points of view, geographical diversity and includes representation from professional organizations

> **"We believe this model—of practitioners supported by researchers—is the best path forward."**
>
> — *Dr. Howard Spivack, MD*
>
> https://nij.ojp.gov/speech/supporting-crime-lab-directors-and-formation-forensic-laboratory-needs-technology-working

such as the American Society of Crime Laboratory Directors (ASCLD), American Academy of Forensic Sciences (AAFS), the Forensic Science Education Programs Accreditation Commission (FEPAC), the International Association for Identification (IAI), Association of State Criminal Investigative Agencies (ASCIA) and the International Chiefs of Police (IACP) Forensic Science Committee. The group unites viewpoints from researchers developing forensic technologies and crime laboratory decision-makers looking to test, validate, and implement emerging technologies. The membership is reviewed by NIJ on an annual basis. The FLN-TWG introduced five new members in May 2020 and three new members in November 2021. **Exhibit 1 lists the current and past FLN-TWG members and their professional role while serving on the FLN-TWG.**

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Exhibit 1. Current and past FLN-TWG members and their professional role while serving on the FLN-TWG

Name	Title	Jurisdiction/Affiliation
Jose Almirall	Distinguished University Professor, Department of Chemistry and Biochemistry and Founding Director, Center for Advanced Research in Forensic Science	Florida International University
Kevin Ardoin	Laboratory Director	Acadiana Criminalistics Laboratory, Louisiana
Les Barnett	Director, Center for Forensics, Information Technology and Security	University of South Alabama
Thomas Busey**	Professor of Cognitive Sciences	Indiana University
Matthew Gamette	Laboratory Systems Director	Idaho State Police Forensic Services
Michael Garvey**	Director	Philadelphia Police Department, Office of Forensic Science
Catherine Grgicak**	Associate Professor of Chemistry	Rutgers University Camden
Wesley P. Grose	Director, Scientific Services Bureau	Los Angeles Sheriff's Department
Lesley Hammer	Consultant	Hammer Forensics, Anchorage, Alaska
Brian Hoey	Laboratory System Director	Missouri State Highway Patrol
Linda Jackson	Director	Virginia Department of Forensic Science
Sarah Kerrigan	Professor, Department of Forensic Science	Sam Houston State University
Timothy Kupferschmid	Chief of Laboratories	New York City Office of Chief Medical Examiner
Troy Lawrence	Sergeant, Digital Forensic Laboratory	Fort Worth Police Department
Brady Mills**	Deputy Assistant Director	Texas Department of Public Safety, Law Enforcement Support – Crime Laboratory Service
Cleveland Miles**	Director, Division of Forensic Sciences	Georgia Bureau of Investigation
Tim Rohrig	Director	Sedgwick County Regional Forensic Science Center, Kansas
Paul Speaker	Professor, College of Business & Economics	West Virginia University
Stephanie Stoiloff	Senior Police Bureau Commander	Forensic Services Bureau Miami-Dade Police Department
Peter Stout	President, CEO	Houston Forensic Science Center
Kristina Takeshita**	Laboratory Director	Los Angeles Police Department, Forensic Science Division
Jody Wolf	Crime Laboratory Administrator	Phoenix Police Department Crime Laboratory
Sarah Seashols Williams**	Associate Professor, Graduate Program Director	Virginia Commonwealth University
Dwight Adams*	Director	University of Central Oklahoma Forensic Science Institute
Angelo Della Manna*	Director	Alabama Department of Forensic Sciences

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Name	Title	Jurisdiction/Affiliation
Jan Girten*	Deputy Director	Colorado Bureau of Investigation Forensic Services
John Grassel*	Officer in Charge	Forensic Services Unit, Rhode Island State Police
Arlene Hall*	Commander, Forensic Sciences Command	Illinois State Police
Ted Hunt*	Senior Advisor to the Attorney General on Forensic Science	Department of Justice
Steven O'Dell*	Chief, Science & Management Services Division	Baltimore Police Department
Jenifer Smith*	Director	District of Columbia Department of Forensic Sciences
Peter Vallone*	Leader	Applied Genetics Group, National Institute of Standards and Technology

Denotes Members who transitioned off the FLN-TWG since 2020

** Denotes New Members who joined the FLN-TWG since 2020*

What Is the FLN-TWG Currently Working On?

Since the first meeting on October 2–3, 2018, the FLN-TWG has convened biannually to discuss technical and applied research needs for a variety of forensic disciplines and identify promising technology transition efforts. These meetings involved presentations from various groups to include: federal agencies to highlight initiatives that may benefit state and local crime laboratories, academic researchers discussing groundbreaking research and from the forensic community discussing technology needs within forensic disciplines. Meeting topics included the following:

- Drugs and toxicology
- Department of Justice (DOJ) programs
- Firearm technology and initiatives
- Advanced biological and DNA technologies
- Sexual assault kit (SAK) tracking, metrics, and definitions
- Stress, trauma, and workforce resiliency in laboratories
- Overviews of R&D programs
- Cloud Storage of Evidence
- Digital Evidence
- Pattern Evidence including Latent Prints, Footwear, Tiremarks and Toolmarks

- Differentiation between Marijuana-type and Hemp-type Cannabis
- Legal Issues

In addition, the FLN-TWG discussed several key programs, initiatives and policy updates and provided feedback on their impact on state and local crime laboratory operations. These included presentations and discussion regarding the following:

- Forensic Science Education Programs Accreditation Commission
- Organization of Scientific Area Committees
- National Integrated Ballistic Information Network
- DOJ Needs Assessment of Forensic Laboratories and Medical Examiner/Coroner Offices
- Forensic Intelligence including DOJ policy updates on molecular genealogy, biometrics and rapid DNA
- FBI Footwear Database
- Uniform Language for Testimony and Reports (ULTRs)
- National Institute of Standards and Technology Cannabis Quality Assurance Program
- White Box, Black Box and Inter Laboratory Studies
- Rules of Evidence

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The FLN-TWG discussed the technology needs of forensic laboratories as well as the criminal justice system at large and considered innovative solutions that focused on technology transition (specifically technical testing and evaluation), information exchange, and training and capacity building of the forensic science infrastructure. Practitioners who successfully implemented technologies into their jurisdictions provided valuable insight about practical considerations for adopting new processes and instrumentation. The importance of interlaboratory exercises, the implementation of standards and the effect on adoption and implementation of new technologies was discussed at several of the FLN-TWG meetings. The FLN-TWG was regularly briefed on the current landscape of white and black box studies and interlaboratory comparisons including the importance that ground truth samples/authentic samples must be used, the samples must be blind to participants, there must be trust between the participants and the coordinator, the samples must test the limits of the examination to test routine casework scenarios, there must be a feedback loop to the participants and the results must be published in peer-reviewed literature.

Additionally, the FLN-TWG met with FEPAC commissioners to discuss the challenges they encounter when hiring new college graduates including a lack of hands-on training and challenges passing background checks. The FLN-TWG also provided formal feedback on the proposed updates to the FEPAC Forensic Science Standards during the public comment period, that endorsed the inclusion of forensic science documentary standards within the FEPAC core curriculum. Furthermore, the FLN-TWG provided input and peer review on the **Needs Assessment of Forensic Laboratories and Medical Examiner/Coroner Offices Report**. The FLN-TWG was regularly briefed on legal issues, including impactful court decisions regarding the admissibility of evidence, trends in legal issues and the activities of the Advisory Committee on Evidence Rules. This included discussion of amendments to Rule 16 of the Federal Rules of Criminal Procedure related to discovery in cases that involve expert witnesses regarding provisions for timing and witness qualifications. In addition, the FLN-TWG discussed the impact of COVID on laboratory operations and legal trends on the use of two-way video testimony. The FLN-TWG was also regularly briefed on NIST's activities including research, foundational literature reviews, interlaboratory comparison studies and OSAC initiatives.

A valuable output from the sessions was a list of helpful resources that crime laboratories could leverage to improve their use of advanced technologies in practice, shown in **Exhibit 2**. The list is not comprehensive.

Exhibit 2. Resources crime laboratories can leverage by organization, program, and overview

Organization	Program	Overview
Drugs and Toxins		
DOJ	**Opioid enforcement and prevention efforts**	The DOJ funds projects that address opioid crises through avenues such as research and on-site programs.
Drug Enforcement Administration (DEA)	Special Testing and Research Lab	▪ The Emerging Trends Program monitors Novel Psychoactive Substances trends based on seized drugs analyzed by the DEA, and reports through the **National Drug Early Warning System** ⬈. ▪ Fentanyl Signature Profiling Program: Analyzes data and generates forensic investigative leads for opioid seizures; also supports state and local agencies in response to overdose deaths. ▪ Technology Evaluation Group: Helps laboratories choose and implement technologies; also conducts their own technology evaluations.

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Exhibit 2. (continued)

Organization	Program	Overview
Drugs and Toxins (continued)		
	Real-Time Communication Network	A vetted community of drug experts sharing knowledge, which enables quick dissemination of information (e.g., new drugs being synthesized, new trends).
	Scientific Working Group for the Analysis of Seized Drugs ⤤	Resource center for forensic laboratories, including a mass spectrometry and infrared library of drugs.
Customs and Border Protection (CBP) Laboratories and Scientific Services	Field Triage Infrared Reachback Program	Field testing and lab analysis program, which uses handheld Fourier-transform infrared spectroscopy equipment to provide presumptive results for illicit substances in the field. The group has tested and purchased multiple handheld analyzers for illicit drug detection.
	Teleforensics Center ⤤	24/7 technical resource for events in which a weapon of mass destruction is suspected.
	Interdiction Technology Branch (ITB)	Will characterize new drugs being discovered and relay new trends and relevant information back to CBP.
National Highway Traffic Safety Administration (NHTSA) Drug-Impaired Driving Toxicology/Data Collection	**Problem Driver Pointer System**	This is a database of the National Driver Register of drivers with motor vehicle licenses that have been revoked, suspended, cancelled, or denied, or those convicted of serious traffic offenses.
	Fatality Analysis Reporting System	The system is a compiled database that catalogues police-reported traffic crashes, which can be used to identify trends in vehicular accidents.
	State Criminal Justice System Capacity Working Group	This stakeholder group identifies priorities, develops tools, and builds recommendations for addressing drug-impaired driving.
	Toxicology and Data Collection Working Group	This stakeholder group works to establish toxicology guidelines and data collection recommendations for drug-impaired driving. They are currently reviewing data from the Center for Forensic Science Research & Education and the National Safety Council's updates for **Recommendations for Toxicological Investigation of Drug-Impaired Driving and Motor Vehicle Fatalities**.
Research and Special Topics		
Centers for Disease Control and Prevention	**Laboratory Response Network for Chemical Threats**	The program supports chemical testing laboratories in 62 areas that include U.S. states, territories, and metropolitan areas; additionally, the program provides emergency response to chemical threats and chemical exposures.
	National Center for Health Statistics	This center is currently looking into ways to improve mortality data collection and infrastructure.
Office of Justice Programs	**Coverdell Grants**	The BJA awards $30 million to support programs that improve the quality and timeliness of forensic science and medical examiner services in state and local governments. These funds can be used for developing programs, training, employing personnel, or addressing forensic science issues.
	Sexual Assault Forensic Evidence- Inventory, Tracking, and Reporting Program Grant Program	The BJA funds state, local, and tribal agencies to develop and implement an evidence management system for SAKs.

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Exhibit 2. (continued)

Organization	Program	Overview
Research and Special Topics (continued)		
	DNA Efficiency Improvement and Capacity Enhancement Program (EICE)	The BJA awards unexpended or unobligated funds from the DNA Capacity Enhancement for Backlog Reduction Program (CEBR) through a competitive grant program.
	DNA Capacity Enhancement for Backlog Reduction (CEBR) Program	The BJA awards funding to states and unites of local government that conduct DNA analysis to increase the capacity of publicly funded laboratories to process more DNA samples.
	Strengthening the Medical Examiner-Coroner System	The BJA awards funding to increase the supply of qualified forensic pathology practitioners and to strengthen the quality and consistency of ME/C services.
	Other Office of Investigative and Forensic Science Programs	**National Missing and Unidentified Persons System (NamUs)** **Postconviction Testing of DNA Evidence**
	Forensic Science Research and Development Program	**Forensic Laboratory Operations** **Research and Development in Forensic Science**
	NIJ Interoffice Solicitations	**Research and Evaluation on Drugs and Crime** **Graduate Research Fellowship Program in Science, Technology, Engineering and Mathematics**
DOJ Special Topics	**Needs Assessment of Forensic Laboratories and Medical Examiner / Coroner Offices**	This document summarizes laboratory needs from nine listening sessions with multiple forensic community stakeholders.
	Advisory Committee on Evidence Rules	DOJ represented in a committee discussing the change in Rule 702 in response to the President's Council of Advisors on Science and Technology report titled *Forensic Science in Criminal Courts: Ensuring Scientific Validity of Feature-Comparison Methods*.
	Digital Evidence Policies and Procedures Manual	This manual is a resource for law enforcement agencies and serve as a starting point for the development of policies and procedures for the collection, handling, and processing of digital evidence.
	Courts and Strategic Report Plan 2020-2024	The Courts Strategic Research Plan was developed to communicate NIJ's research agenda and outlines the strategic priorities and objectives of NIJ that are interrelated and vital to the examination of opportunities and challenges faced by court systems.
Additional Special Topics	National Academy of Science Report, 2009. *Strengthening Forensic Science in the United States: A Path Forward*	On November 22, 2005, the Science, State, Justice, Commerce and Related Agencies Appropriations Act of 2006 became law and under the terms of the statue, Congress authorized the National Academy of Sciences to conduct a study on forensic science.
	President's Council of Advisors on Science and Technology (PCAST) 2016	Report to the President, Forensic Science in Criminal Courts: Enduring Scientific Validity of Feature-Comparison Methods

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Exhibit 2. (continued)

Organization	Program	Overview
Firearm Technology and Initiatives		
Bureau of Alcohol, Tobacco, Firearms, and Explosives (ATF)	**Crime Gun Intelligence Centers (CGIC)** ⬈	25 centers collect and analyze evidence in shooting cases using the **National Integrated Ballistics Information Network (NIBIN)** ⬈ and **eTrace**. The CGIC aims to help identify serial shooters and connect shooting incidents.
	NIBIN National Correlation and Training Center	The ATF provides support to 32 sites and 182 law enforcement agencies with correlational review of exhibits, which are peer-reviewed and technically reviewed by a firearm examiner.
Bureau of Justice Assistance (BJA)	**CGIC Initiative** ⬈	The initiative is a joint partnership between the ATF and BJA that awards grant funding for cities to implement the CGIC model.
	National Resource and Technical Assistance Center for Improving Law Enforcement Investigations ⬈	BJA conducts site assessments to help develop CGIC strategic plans, develop CGIC best practices, and provide opportunities for sites to develop long-term CGIC capacity.
Federal Bureau of Investigation (FBI)	Firearms/Toolmark Unit	The FBI conducts evaluations of firearm- and toolmark-related technologies to provide objective information for agencies looking to implement new technologies.
Advanced Biological and DNA Technologies		
National Institute of Standards and Technology (NIST)	**STRSeq**	The STR Sequencing Project is a collaboration among **NIST**, **King's College** ⬈ , the **University of North Texas Health Science Center** ⬈, and **University of Santiago de Compostela** ⬈ that aggregated allele data from their sequencing studies. NIST is developing a user interface at STRseq.nist.gov to encourage laboratories to submit their population data.
Stress, Trauma, and Workforce Resiliency		
Office for Victims of Crime (OVC)	**Vicarious Trauma Toolkit**	The OVC has developed resources to help individuals, managers, and leaders cope with trauma.
R&D Updates		
National Policing Improvement Agency (NPIA)	National Footwear Reference Collection (NFRC)	The NFRC is a database of more than 30,000 outsoles that helps determine what kind of shoe left an impression at a crime scene.
FORESIGHT (including American Society of Crime Laboratory Directors [ASCLD]) ⬈	**Project FORESIGHT 20/20** ⬈	This project generates performance reports and evaluations from data uploaded from a laboratory's information management system (LIMS). The project is made up of a network of 139 laboratories (mostly of which are Western African and Latin American National Laboratories). FORESIGHT is currently working with ASCLD to develop a software interface bridging a lab's current LIMS and their financial and personnel management systems.
Laboratory Efficiency and Standards		
NIST Forensic Science Standards Board	**Organization of Scientific Area Committees (OSAC) for Forensic Science Registry Implementation Plan**	This resource describes multiple ways in which forensic laboratories can implement OSAC standards.

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Exhibit 2. (continued)

Organization	Program	Overview
Laboratory Efficiency and Standards (continued)		
DOJ	**Uniform Language for Testimony and Reports (ULTR)**	The ULTR is a collection of documents that provides common language for testimony and reports concerning forensic disciplines. These documents are meant to improve consistency in language and ensure that probative statements are properly conveyed in court.
Firearms, Toolmarks and Ballistics		
Additional Special Topics	**National Research Council Report on Ballistic Imaging, 2008** ⧉	The final report of the Committee to assess the Feasibility, Accuracy, and Technical Capability of a National Ballistics Database.
	Association of Firearms and Toolmark Examiners (AFTE) Theory of identification ⧉	The AFTE theory of identification defines the sufficient agreement of toolmarks that enables determinations of common origin of two items.
	Scientific Working Group for Firearms and Toolmarks (SWGGUN) ⧉ **Admissibility Resource Kit (ARK)** ⧉	The Admissibility Resource Kit (ARK) is a repository of information designed to assist Firearms and Toolmark Examiners in preparation for evidence admissibility hearings. The ARK includes an overview of admissibility rules, foundational overview of Firearm/Toolmark Identification, Review of Admissibility Elements, Court Rulings, Opposing and Supportive viewpoints of Firearm and Toolmark Identification and appendices.
Cloud Storage		
DOJ	**Criminal Justice Information Services (CJIS) Security Resource Center**	**Criminal Justice Information Services (CJIS) Security Policy** and **Requirements Companion Document to the FBI CJIS Security Policy**
	Recommendations for Implementation of Cloud Computing Solutions	This technical report provides recommendations for specific policies and procedures to be followed by Criminal Justice Information System (CJIS) community members implementing cloud computing solutions.

Conclusion: What's Next for the FLN-TWG?

The FLN-TWG continues to meet and discuss key issues related to improving the practice of forensic science and laboratory efficiency. This group initially established five subcommittees that developed implementation strategies focused on the following high-priority areas:

1. **Next-generation sequencing for DNA analysis** ⧉
2. **Three Dimensional Technologies for firearms / toolmark identification** ⧉
3. **Quadrupole / time-of-flight mass spectrometry for toxicological analysis** ⧉
4. **Proteomic mass spectrometry for bodily fluid identification** ⧉

5. **Incorporation of Digital Evidence into project FORESIGHT** ⧉

In the fall of 2021, the FLN-TWG established additional subcommittees to concentrate on the following issues:

- Improving the Laboratory Information Management System (LIMS) across the nation's crime laboratories
- Identifying the technology needs of the forensic science practitioner to facilitate adoption of standards
- Increasing research activities in crime laboratories to aid the adoption of new technologies
- Identifying novel approaches and technologies to challenges in seized drug analysis

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Through regular meetings, the FLN-TWG promotes rich dialogue to outline laboratory needs and the best path forward for adopting innovations. The group communicates these insights to the greater forensic community through the FTCOE and continues to encourage collaboration and discussion between researchers and crime laboratory personnel. The NIJ's FTCoE supports the dissemination of FLN-TWG outputs and insights to the community as part of the FTCoE's activities to support the implementation of new forensic technologies and evidence-based best practices. The FLN-TWG will next meet in the Fall of 2022.

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Suggested Citation
Grassel, John, Nicole Jones, Jennifer Love, Jonathon McGrath, Jeri Ropero-Miller, and Lucas Zarwell. *The NIJ Forensic Laboratory Needs Technology Working Group—Progress to date and future plans.* Forensic Technology Center of Excellence and U.S. Department of Justice, National Institute of Justice, Office of Investigative and Forensic Sciences. 2022, November.

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