

Forensic Science Under the Spotlight

By Judge Herbert B. Dixon Jr.

Earlier this year, the National Academy of Sciences¹ issued a press release that carried the headline: “‘Badly Fragmented’ Forensic Science System Needs Overhaul; Evidence to Support Reliability of Many Techniques Is Lacking.” If that headline were not eye-catching enough, the press release opened with:

WASHINGTON—A congressionally mandated report from the National Research Council finds serious deficiencies in the nation’s forensic science system and calls for major reforms. . . .²

And, if the combination of the press release and the National Research Council (NRC) report were not sufficient, Justice Antonin Scalia, writing for the majority in the landmark case of *Melendez-Diaz v. Massachusetts*, cited the report within months of its release, commenting that “[s]erious deficiencies have been found in the forensic evidence used in criminal trials.”³

The NRC report is titled *Strengthening Forensic Science in the United States: A Path Forward*.⁴ As a trial judge who has presided over litigation concerning issues raised by the report and seen its impact on the evidentiary foundation of certain forensic disciplines, I strongly advise colleagues to obtain the report and get a head start on these issues. You are likely to see challenges to forensic evidence play out in your courtroom very soon.

Some say the NRC report is the juggernaut that the criminal defense bar has been waiting for—namely, a pronouncement from a credible scientific entity that supports frequent defense arguments against blind acceptance of a law enforcement expert’s opinion that the fingerprint on the crime scene is the defendant’s, that the bullet that killed

the victim and shell casings found on the murder scene were fired from the gun found in the defendant’s home, that the hair on the victim’s body microscopically matched the defendant’s hair . . . well, you get the point.

Although individual court decisions occasionally have called into question such types of expert opinions, the criminal defense bar now has significant support in the form of the NRC report issued under the auspices of the National Academy of Sciences.

The committee authoring the report was composed of members of the scientific, forensic, and legal communities. The committee held formal hearings, received testimony from numerous experts, reviewed published materials, and performed independent research studies related to various forensic sciences. The forensic science disciplines discussed in the report read like a laundry list of forensic evidence frequently encountered in state and federal courts and administrative tribunals. The forensic science disciplines examined by the authoring committee included:

- biological evidence (including blood, semen, saliva, vaginal secretions, sweat, epithelial cells, vomitus, feces, urine, hair, tissue, bones, microbiological and viral agents, and DNA);
- analysis of controlled substances;
- friction ridge analysis (fingerprints, palm prints, and sole prints);
- other pattern/impression evidence (e.g., shoeprints and tire tracks);
- toolmark and firearms identification;
- analysis of hair and fiber evidence;

- questioned document examination;
- analysis of paint and coatings evidence;
- analysis of explosives evidence and fire debris;
- forensic odontology (bite marks and dental identification);
- bloodstain pattern analysis;
- digital and multimedia analysis; and more.

Harry T. Edwards, senior circuit judge and chief judge emeritus for the U.S. Court of Appeals for the D.C. Circuit, and Constantine Gatsonis, director of the Center for Statistical Sciences at Brown University, co-chaired the authoring committee. Their preface to the report contains an ominous forecast of the report’s findings. The committee was surprised by the consistency of the messages they heard:

The forensic science system, encompassing both research and practice, has serious problems that can only be addressed by a national commitment to overhaul the current structure that supports the forensic science community in this country.⁵

The report offers numerous findings that have energized opponents of forensic evidence and caused concern in the law enforcement community. In a discussion of toolmark and firearms analysis, the NRC report refers to a 2008 NRC study entitled *Ballistic Imaging*; the observation is made that “[t]he validity of the fundamental assumptions of uniqueness and reproducibility of firearms-related toolmarks has not yet been fully demonstrated.”⁶ Moreover, the report states that “[s]ufficient studies have not been done to understand the reliability and repeatability

of the methods.” Additionally, the report offers the conclusion that a “fundamental problem with toolmark and firearms analysis is the lack of a precisely defined process.”⁷ As a result of this report, trial judges should get ready for a new and energized cross examination of forensic experts.

In discussing handwriting comparison, the report notes the existence of recent studies suggesting there may be a scientific basis for handwriting comparison in the absence of intentional obfuscation or forgery. However, the report goes on to call for strengthening the scientific basis for handwriting comparisons, as there has been only limited research to quantify the reliability and replicability of the practices currently used by trained document examiners.⁸

The report pays a compliment to the science of DNA analysis. It notes the high degree of confidence with which an expert in the field may state that two profiles likely came from the same person where the DNA analysis is of properly collected and analyzed samples. But, after complimenting the science of DNA analysis, the report criticizes other forensic disciplines in its observation that “[a]mong existing forensic methods, only nuclear DNA analysis has been rigorously shown to have the capacity to consistently, and with a high degree of certainty, demonstrate a connection between an evidentiary sample and a specific individual or source.”⁹

A discussion in the report that I found very interesting concerns the issue of contextual bias. For instance, some studies have demonstrated that identification decisions on the same fingerprint can change solely by presenting the print

in a different context. The report notes recent research in one study that provided evidence of contextual bias in an experiment involving experienced fingerprint examiners. The examiners were asked to analyze fingerprints that, unknown to them, they had analyzed previously in their careers. In half of the examinations, contextual biasing was introduced. For example, the instructions to the examiner that accompanied the latent prints included information such as the “suspect

confessed to the crime” or the “suspect was in police custody at the time of the crime.” In one-fourth of the examinations that included contextual manipulation, the report notes that the examiners reached conclusions that were consistent with the biasing information and different from the results they had previously reached when examining the same prints in their daily work.¹⁰

Another example of contextual bias concerns the 2004 case of Brandon

Mayfield. Mayfield was a 37-year-old civil and immigration lawyer practicing in Portland, Oregon. He was arrested as a material witness in connection with terrorist bombings in Madrid, Spain, that killed 191 people and injured thousands more, including a number of U.S. citizens. A fingerprint was found on a bag in Spain containing detonation devices similar to those used in the bombings. FBI fingerprint examiners subsequently linked the fingerprint to Mayfield. The link was independently analyzed and confirmed by an outside experienced fingerprint expert. Soon after the submitted fingerprint became associated with Mayfield, Spanish authorities alerted the

FBI to additional information that cast doubt on the findings. Eighteen days after Mayfield’s arrest, the government announced that the FBI erred in its identification of Mayfield, and Mayfield was released. In March 2006, the Office of the Inspector General of the U.S. Department of Justice issued a comprehensive analysis of how the misidentification occurred. The FBI also conducted its own review by a panel of independent experts. The reviews concluded that the problem was bias and “circular reasoning” of the FBI examiners. In November 2006, the federal government agreed to pay Mayfield \$2 million for his wrongful jailing in connection with the 2004 terrorist bombing.¹¹

In his prepared testimony discussing the NRC report before the U.S. Senate Committee on the Judiciary, Judge Edwards, co-chair of the authoring committee, stated:

[F]or years, the courts have been led to believe that disciplines such as fingerprinting stand on par with DNA analysis. For example, in a decision issued by the Seventh Circuit, the court reported that an FBI fingerprint expert had “testified that the

Badly Fragmented Forensic Science System Needs Overhaul; Evidence for Reliability of Many Techniques Lacking.

—Recent National Academy of Sciences press release headline



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error rate for fingerprint comparison is essentially zero.” In a later decision issued by the Fourth Circuit, that court cited the Seventh Circuit opinion approvingly, noting that an expert from the FBI had testified that the error rate for fingerprint comparison was “essentially zero.” The committee’s report rejects as scientifically implausible any claims that fingerprint analyses have “zero error rates.” A “zero error rate” is a myth in fingerprint analyses and in all other forensic disciplines.¹²

The report also references practical problems that negatively affect forensic science disciplines in some localities, for example:

- underresourced and understaffed laboratories;
- the need for additional funds to support forensic science research; and
- extreme disaggregation marked by multiple types of practitioners with different levels of education and training, and different professional cultures and standards for performance.

In his statement before the Senate Judiciary Committee, Judge Edwards took care to note that the NRC report was not intended to offer judgment on any case in the judicial system, assess past criminal convictions, or speculate about pending or future cases. He also noted that the report offers no proposals for law reform, as that was beyond the committee’s charge. No one will be surprised if the report is cited authoritatively for its findings concerning the scientific foundation of particular areas of forensic science. Nor will anyone be surprised if courts take into account the scientific foundation of particular types of forensic science evidence when considering the admissibility of such evidence. However, according to Judge Edwards, “each case in the criminal justice system must be decided on the record before

the court pursuant to the applicable law, controlling precedent, and governing rules of evidence. The question whether forensic evidence in a particular case is admissible under applicable law is not coterminous with the question whether there are studies confirming the scientific validity and reliability of a forensic science discipline.”¹³

My colleagues reading the NRC report will note that, notwithstanding the report’s numerous criticisms concerning the lack of scientific methodology among various forensic disciplines, one of the report’s primary recommendations concerns the need for strong governance to adopt and promote an aggressive, long-term agenda to help strengthen the forensic disciplines.

The report’s “Recommendation 1” is that Congress establish and appropriate funds for an independent federal entity, the National Institute of Forensic Science (NIFS), to promote the development of forensic science into a mature field of multidisciplinary research and practice. The report envisions that the NIFS would focus on various issues important to the sound development of forensic science disciplines, including establishing and enforcing best practices; establishing standards for the mandatory accreditation of laboratories and mandatory certification of forensic science practitioners; promoting scholarly, competitive, peer-reviewed research and technical development in the forensic science disciplines and forensic medicine; and developing a strategy to improve forensic science research and educational programs.¹⁴

In the interim, the future litigation in which the NRC report will doubtless be cited is likely to result in thousands of decisions across the country concerning the admissibility of proffered forensic evidence. Although I make no predictions concerning the ultimate outcome, I am confident that as word of the report’s implications spreads across the country, you should expect the challenge to occur in a courtroom near you, sooner rather than later. ■

Endnotes

1. The National Academy of Sciences includes the National Academy of Engineering, the Institute of Medicine, and the National Research Council. Collectively, these entities are referred to as the National Academies. See http://www.nasonline.org/site/PageServer?pagename=ABOUT_main_page.
2. Press Release, the National Academies, Feb. 18, 2009, available at <http://www8.nationalacademies.org/onpinews/newsitem.aspx?RecordID=12589>.
3. *Melendez-Diaz v. Massachusetts*, 129 S. Ct. 2527, 2537 (2009).
4. COMMITTEE ON IDENTIFYING THE NEEDS OF THE FORENSIC SCIENCES COMMUNITY, COMMITTEE ON APPLIED AND THEORETICAL STATISTICS & NATIONAL RESEARCH COUNCIL, STRENGTHENING FORENSIC SCIENCE IN THE UNITED STATES: A PATH FORWARD (2009). All citations herein to the NRC Report are to the prepublication report, which is available at http://ag.ca.gov/meetings/tf/pdf/2009_NAS_report.pdf.
5. *Id.* at P-1.
6. *Id.* at 5-20.
7. *Id.* at 5-21.
8. *Id.* at 5-30.
9. *Id.* at 3-12.
10. *Id.* at 4-10.
11. *Id.* at 1-9, 3-16.
12. *Strengthening Forensic Science in the United States: A Path Forward: Before the S. Comm. on the Judiciary*, 111th Cong. (Mar. 18, 2009) (statement of the Honorable Harry T. Edwards, Co-Chair, Committee on Identifying the Needs of the Forensic Science Community, The Research Council of the National Academies), available at <http://judiciary.senate.gov/pdf/09-03-18EdwardsTestimony.pdf>.
13. *Id.*
14. NRC Report, *supra* note 4, at S-14.