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The 2009 NAS Forensic Science Report: A Literature Review

Paul C. Giannelli*

In February 2009, the National Academy of Sciences (NAS) released its report on forensic science.¹ The popular press immediately trumpeted the report's release, with headlines such as (1) "Report Urges Overhaul of Crime Lab System,"² (2) "Real-life Police Forensics Don't Resemble 'CSI': Reliability is 'Low or Non-existent,' Report Finds"³ and (3) "Science Found Wanting in Nation's Crime Labs."⁴ Law review articles variously described the report as a "blockbuster,"⁵ "a watershed,"⁶ "a scathing critique,"⁷ "a milestone,"⁸ and "pioneering."⁹

Within three months of its publication, Justice Scalia cited the report in a Supreme Court decision, writing: "Forensic evidence is not uniquely immune from the risk of manipulation Serious deficien-

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¹National Research Council, National Academy of Sciences, *Strengthening Forensic Science in the United States: A Path Forward* (2009) [hereinafter *NAS Forensic Science Report*]. The National Research Council is the research arm of the NAS.

²Jason Felch & Maura Dolan, *Report Urges Overhaul of Crime Lab System*, L.A. Times, Feb. 19, 2009, at 9.

³Dan Vergano, *Real-life Police Forensics Don't Resemble 'CSI': Reliability is 'Low or Non-existent,' Report Finds*, USA Today, Feb. 19, 2009, at 4D.

⁴Solomon Moore, *Science Found Wanting in Nation's Crime Labs*, N.Y. Times, Feb. 5, 2009, at A1.

⁵Jonathan J. Koehler, *Forensic Science Reform in the 21st Century: A Major Conference, A Blockbuster Report and Reasons to be Pessimistic*, 9 Law, Probability & Risk 1, 1 (2010).

⁶Jennifer L. Mnookin et al., *The Need for a Research Culture in the Forensic Sciences*, 58 UCLA L. Rev. 725, 731 (2011) [hereinafter *Research Culture*].

⁷William C. Thompson, *The National Research Council's Plan to Strengthen Forensic Science: Does the Path Forward Run Through the Courts?* 50 *Jurimetrics J.* 35, 35 (2009).

⁸D. Michael Risinger, *The NAS/NRC Report on Forensic Science: A Glass Nine-Tenths Full (This is About the Other Tenth)*, 50 *Jurimetrics J.* 21, 21 (2009).

⁹Daniel S. Medwed, *Introduction, Path Forward or Road to Nowhere? Implications of the 2009 National Academy of Sciences Report on the Forensic Sciences*, 2010 *Utah L. Rev.* 221, 221.

cies have been found in the forensic evidence used in criminal trials.”¹⁰ Both the Senate and the House held hearings,¹¹ and a bill was introduced in Congress.¹² In addition, the President appointed a committee on forensic science.¹³

The Report’s recommendations were wide-ranging. Some recommendations were structural—e.g., the creation of an independent federal entity (the National Institute of Forensic Sciences, or NIFS) to oversee the field,¹⁴ the removal of crime laboratories from the “administrative” control of law enforcement agencies,¹⁵ and the replacement of coroner offices with medical examiner systems.¹⁶ Other recommendations concerned accreditation of crime labs, certification of examiners, and standardization of procedures.¹⁷

¹⁰*Melendez-Diaz v. Massachusetts*, 557 U.S. 305, 129 S. Ct. 2527, 2536–37, 174 L. Ed. 2d 314 (2009). The Court wrote:

Nor is it evident that what respondent calls “neutral scientific testing” is as neutral or as reliable as respondent suggests. Forensic evidence is not uniquely immune from the risk of manipulation. According to a recent study conducted under the auspices of the National Academy of Sciences, “[t]he majority of [laboratories producing forensic evidence] are administered by law enforcement agencies, such as police departments, where the laboratory administrator reports to the head of the agency.” And “[b]ecause forensic scientists often are driven in their work by a need to answer a particular question related to the issues of a particular case, they sometimes face pressure to sacrifice appropriate methodology for the sake of expediency.” A forensic analyst responding to a request from a law enforcement official may feel pressure—or have an incentive—to alter the evidence in a manner favorable to the prosecution.

Id. at 2536 (citations omitted). See also id. at 2537 (“Confrontation is designed to weed out not only the fraudulent analyst, but the incompetent one as well.”).

¹¹See Strengthening Forensic Science in the United States: Hearing Before the S. Comm. on the Judiciary, 111th Cong. 1 (2009) [hereinafter Senate Hearing (Sept. 9, 2009)]. The U.S. Senate Committee on Commerce, Science, and Transportation held a hearing on Dec. 7, 2011. See also National Research Council’s Publication “Strengthening Forensic Science in the United States: A Path Forward”: Hearing Before the Subcomm. on Crime, Terrorism, and Homeland Security of the H. Comm. on the Judiciary, 111th Cong. 3 (2009) [hereinafter House Hearing (May 13, 2009)].

¹²See Criminal Justice and Forensic Science Reform Act of 2011, S. 132, 112th Cong. § 201(a) (2011) (as referred to S. Comm. on the Judiciary, Jan. 25, 2011).

¹³Subcommittee on Forensic Science, National Science and Technology Council, Executive Office of the President.

¹⁴NAS Forensic Science Report, *supra* note 1, at 19 (Recommendation 1).

¹⁵NAS Forensic Science Report, *supra* note 1, at 24 (Recommendation 4).

¹⁶NAS Forensic Science Report, *supra* note 1, at 27 (Recommendation 11(a)).

¹⁷NAS Forensic Science Report, *supra* note 1, at 19 (Recommendation 1(b)), 25 (Recommendation 7), and 26 (Recommendation 8). Still other recommendations covered such diverse topics as the interoperability of automated fingerprint systems (Id. at 30–31 (Recommendation 11)), education and training in the forensic sciences

Perhaps the most important recommendation was directed at research—in particular, the need for validation studies on such common techniques as fingerprint examinations,¹⁸ firearms (ballistics) and toolmark identifications,¹⁹ questioned document comparisons,²⁰ hair analysis,²¹ and bite mark examinations.²² According to the report: “Among 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.”²³

Arizona State,²⁴ Cleveland State,²⁵ and UCLA²⁶ law schools put on conferences. In addition, the *Utah Law Review*²⁷ and the *Fordham*

(Id. at 25 (Recommendation 7)), codes of ethics (Id. at 26 (Recommendation 9)), and homeland security issues (Id. at 31–32 (Recommendation 12)).

¹⁸NAS Forensic Science Report, supra note 1, at 144 (noting that research was needed “[t]o properly underpin the process of friction ridge [fingerprint] identification”).

¹⁹NAS Forensic Science Report, supra note 1, at 154 (“Sufficient studies [on firearms identification] have not been done to understand the reliability and repeatability of the methods[.]”).

²⁰NAS Forensic Science Report, supra note 1, at 166 (noting that the “scientific basis for handwriting comparisons needs to be strengthened”).

²¹NAS Forensic Science Report, supra note 1, at 161 (noting that “testimony linking microscopic hair analysis with particular defendants is highly unreliable”).

²²NAS Forensic Science Report, supra note 1, at 174 (noting that “[n]o thorough study has been conducted of large populations to establish the uniqueness of bite marks”).

²³NAS Forensic Science Report, supra note 1, at 100.

²⁴The articles from the Arizona State conference are published in two different journals. See Itiel E. Dror, How Can Francis Bacon Help Forensic Science? The Four Idols of Human Biases, 50 *Jurimetrics J.* 93 (2009); Harry T. Edwards, Solving the Problems that Plague the Forensic Science Community, 50 *Jurimetrics J.* 5 (2009); Paul C. Giannelli, The NRC Report and Its Implications for Criminal Litigation, 50 *Jurimetrics J.* 53 (2009); Kent Roach, Forensic Science and Miscarriages of Justice: Some Lessons From Comparative Experience, 50 *Jurimetrics J.* 67 (2009); Thompson, supra note 7; Risinger, supra note 8.

Simon A. Cole, Who Speaks for Science? A Response to the National Academy of Sciences Report on Forensic Science, 9 *Law, Probability & Risk* 25 (2010); Itiel E. Dror & Jennifer L. Mnookin, The Use of Technology in Human Expert Domains: Challenges and Risks Arising from the Use of Automated Fingerprint Identification Systems in Forensic Science, 9 *Law, Probability & Risk* 47 (2010); Jonathan J. Koehler, Forensic Science Reform in the 21st Century: A Major Conference, A Blockbuster Report and Reasons to be Pessimistic, 9 *Law, Probability & Risk* 1 (2010); Erin Murphy, What ‘Strengthening Forensic Science’ Today Means for Tomorrow: DNA Exceptionalism and the 2009 NAS Report, 9 *Law, Probability & Risk* 7 (2010); Glen Whitman & Roger Koppl, Rational Bias in Forensic Science, 9 *Law, Probability & Risk* 69 (2010).

²⁵No articles were published from this conference.

*Urban Law Journal*²⁸ published written symposia.²⁹ The legal articles focus on a wide variety of issues such as the need for further research on cognitive bias,³⁰ the practicability of independent crime labs,³¹ and DNA exceptionalism.³²

This essay briefly discusses some of these articles as well as aspects of the congressional hearings.

A. Attacking the Messenger

Surprisingly, some criticism was directed at the NAS itself: "Questions were raised about the thoroughness of the Committee's research, the practicality of its recommendations, and its failure to accomplish

²⁶ See Research Culture, *supra* note 6. See also Nancy Gertner, Commentary on the Need for a Research Culture in the Forensic Sciences, 58 UCLA L. Rev. 789 (2011); Pierre Margot, Commentary on the Need for a Research Culture in the Forensic Sciences, 58 UCLA L. Rev. 795 (2011).

²⁷ See Paul C. Giannelli, Independent Crime Laboratories: The Problem of Motivational and Cognitive Bias, 2010 Utah L. Rev. 247; Jacqueline McMurtrie, Swirls and Whorls: Litigating Post-Conviction Claims of Fingerprint Misidentification After the NAS Report, 2010 Utah L. Rev. 267; Joëlle Anne Moreno, C.S.I. Bulls#t: The National Academy of Sciences, Melendez-Diaz v. Massachusetts, and Future Challenges to Forensic Science and Forensic Experts, 2010 Utah L. Rev. 327; Jane Campbell Moriarty, Will History Be Servitude?: The NAS Report on Forensic Science and the Role of the Judiciary, 2010 Utah L. Rev. 299; Michael S. Pardo, Evidence Theory and the NAS Report on Forensic Science, 2010 Utah L. Rev. 367; D. Michael Risinger, The NAS/NRC Report on Forensic Science: A Path Forward Fraught with Pitfalls, 2010 Utah L. Rev. 225.

²⁸ See Simon A. Cole, Acculturating Forensic Science: What is 'Scientific Culture', and How Can Forensic Science Adopt It?, 38 Fordham Urb. L.J. 435 (2010); Paul C. Giannelli, Forensic Science: Why No Research?, 38 Fordham Urb. L.J. 503 (2011); Geoffrey S. Mearns, The NAS Report: In Pursuit of Justice, 38 Fordham Urb. L.J. 429 (2010); D. Michael Risinger, Whose Fault?—Daubert, the NAS Report, and the Notion of Error in Forensic Science, 38 Fordham Urb. L.J. 519 (2010); Joseph Sanders, "Utterly Ineffective": Do Courts Have a Role in Improving the Quality of Forensic Expert Testimony?, 38 Fordham Urb. L.J. 547 (2010).

²⁹ Other articles also addressed the report. See, e.g., Paul C. Giannelli, Daubert and Forensic Science: The Pitfalls of Law Enforcement Control of Scientific Research, 2011 U. Ill. L. Rev. 53; David H. Kaye, The Good, the Bad, and the Ugly: The NRC Report on Strengthening Forensic Science in America, 50 Sci. & Just. 8 (2010); Kenneth E. Melson, Embracing the Path Forward: The Journey to Justice Continues, 36 New Eng. J. on Crim. & Civ. Confinement 197 (2010); Jennifer L. Mnookin, The Courts, The NAS, and the Future of Forensic Science, 75 Brooklyn L. Rev. 1209 (2010).

³⁰ See Dror & Mnookin, *supra* note 24; Risinger, *supra* note 8; Whitman & Koppl, *supra* note 24.

³¹ See Giannelli, *supra* note 27.

³² See Murphy, *supra* note 24.

parts of what Congress chartered the NAS to do.”³³ Moreover, at a Senate Judiciary Committee hearing, one prosecutor rebuked the NAS for an “agenda-driven attack upon well-founded investigative techniques” and complained that “[t]he absence of prosecutors on the [committee] has not been lost on those of us serving every day in the trenches of America’s courtrooms.”³⁴

Actually, a former prosecutor served on the committee,³⁵ as did one defense attorney. More importantly, the NAS is one of the most prestigious scientific organizations in the country,³⁶ which is why Congress provided \$1,500,000 for the project. The NAS Committee included prominent scientists³⁷ and took over two years to issue the 300-page report. Six of the seventeen committee members had strong ties to the forensic science community.³⁸ Most of the presenters at the eight open meetings (sixteen days) came from the forensic science

³³Melson, *supra* note 29, at 197–98.

³⁴Senate Hearing (Sept. 9, 2009), *supra* note 11 (statement of Barry D. Matson, Deputy Director of the Alabama District Attorneys Association). He also imitated that the creation of an NIFS would politicize science. In his view, “[f]orensic sciences is [sic] the search for truth and if you’re going to have an agency with a new director appointed every four years and different ideologies coming in and new national bureaucracies, it’s not what we need.” Mary Orndorff, *Congress Looks at Court Evidence Standards: Sessions Disputes Need for New Agency*, Birmingham News, Sept. 10, 2009, at 4A.

³⁵See Mearns, *supra* note 28, at 429 (“As a former federal prosecutor, I believe it is imperative that the recommendations in the NAS Report be implemented. Implementing our recommendations will advance the principal goal of the NAS Report: to assist law enforcement officials in identifying and convicting people who commit crimes.”).

³⁶“Members are elected to the National Academy of Sciences in recognition of their distinguished and continuing achievements in original research. Membership is a widely accepted mark of excellence in science and is considered one of the highest honors that a scientist can receive . . . There are approximately 2,200 Academy members and 400 foreign associates. Some 200 NAS members have received Nobel prizes.” Nat’l Acad. of Scis., *About NAS: Membership*, <http://www.nasonline.org/about-nas/membership/> (last visited Dec. 29, 2011).

³⁷See NAS Forensic Science Report, *supra* note 1, app. A. See also Mnookin, *supra* note 29, at 1235 n.78 (“The make-up of the committee has been criticized by the forensic science community for having insufficient practitioners. It is interesting to note that the committee in fact had several forensic practitioners, while it had not a single member who had already published critical work concerning the adequacy of the research basis of forensic science.”).

³⁸There were two forensic pathologists and “[f]our [other members] had experience as analysts in forensic science laboratories, though their careers had taken different paths thereafter.” Risinger, *supra* note 27, at 228. “The Committee was hardly a hotbed of card-carrying forensic science skeptics.” *Id.* at 229.

community.³⁹ Moreover, the NAS has published numerous studies on a wide-range of scientific issues ever since President Lincoln signed its charter.⁴⁰ Some of these studies dealt with evidence used in criminal prosecutions: sound spectrometry ("voiceprints"),⁴¹ two DNA reports,⁴² polygraph testing,⁴³ and bullet lead analysis.⁴⁴ Indeed, one scholar has suggested that the NAS Report is so authoritative that it may be admitted in evidence as a learned treatise and subject to judicial notice.⁴⁵

B. Resistance to Change

While parts of the forensic science community embraced the NAS Report,⁴⁶ others dissented. A number of articles describe this resistance.⁴⁷ When people have a great deal invested in the status quo, recalcitrance is frequently robust. Science is no exception, as Thomas Kuhn noted in his transformative text. According to Kuhn, many researchers are so embedded in the past that they find it difficult, if not impossible, to move to a new paradigm even when

³⁹See Risinger, *supra* note 27, at 230 ("In the first year, the Committee held eight days of hearings in which it heard from sixty-four presenting witnesses . . . [M]ost of the . . . fifty-six presenters were members of the forensic science establishment or representatives of law enforcement.").

⁴⁰See Act to Incorporate the National Academy of Sciences, ch. 111, § 1, 12 Stat. 806 (1863).

⁴¹See Nat'l Research Council, Nat'l Acad. of Scis., *On the Theory and Practice of Voice Identification* (1979).

⁴²See Nat'l Research Council, Nat'l Acad. of Scis., *The Evaluation of Forensic DNA Evidence* (1996); Nat'l Research Council, Nat'l Acad. of Scis., *DNA Technology in Forensic Science* (1992).

⁴³See Nat'l Research Council, Nat'l Acad. of Scis., *The Polygraph and Lie Detection* (2003).

⁴⁴See Nat'l Research Council, Nat'l Acad. of Scis., *Forensic Analysis: Weighing Bullet Lead Evidence* (2004).

⁴⁵Edward J. Imwinkelried, *Using the National Research Council's Report, Strengthening Forensic Science in the United States: a Path Forward* (2009) in the Courtroom, 47 *Crim. L. Bull.* 975, 995 (noting that "there is a powerful argument that the 2009 report qualifies as a learned treatise").

⁴⁶The American Academy of Forensic Sciences supports the recommendations of the National Academy of Sciences report. Press Release, Am. Acad. of Forensic Scis., *The American Academy of Forensic Sciences Approves Position Statement in Response to the National Academy of Sciences' "Forensic Needs" Report*, (Sept. 4, 2009) (on file with author), at 1-2, available at http://aafs.org/sites/default/files/pdf/AAFS_Position_Statement_for_Press_Distribution_090409.pdf.

⁴⁷See Koehler, *supra* note 24; Murphy, *supra* note 24; Moreno, *supra* note 27.

confronted with persuasive evidence.⁴⁸ Oreta y Gasset said it more colorfully:

The man who discovers a new scientific truth has previously had to smash to atoms almost everything he had learnt, and arrives at the new truth with hands bloodstained from the slaughter of a thousand platitudes.⁴⁹

Indeed, the NAS Committee proposed a new agency, NIFS, precisely because of the expected opposition to change. The report found that some federal entities were “too wedded” to the status quo and “have failed to pursue a rigorous research agenda to confirm the evidentiary reliability of methodologies used in a number of forensic science disciplines.”⁵⁰ As a result, these “agencies are not good candidates to oversee the overhaul of the forensic science community.”⁵¹

While some insiders found nothing “new” in the NAS Report,⁵² those outside the forensic science community said the report caused an epiphany. For example, Judge Harry Edwards, co-chair of the NAS Committee and a respected jurist with over thirty years on the bench, wrote:

I started this project with no preconceived views about the forensic science community. Rather, I simply assumed, as I suspect many of my judicial colleagues do, that forensic science disciplines typically are well-grounded in scientific methodology and that crime laboratories and forensic science practitioners follow proven practices that ensure the validity and reliability of forensic evidence offered in court. I was surprisingly mistaken in what I assumed. The truth is that the manner in which forensic evidence is presented on television—as invariably valid and reliable—does not correspond with reality.⁵³

An experienced prosecutor, who also served on the NAS Committee, echoed these sentiments: “During the two-year period in which I served on the NAS Committee, my views about forensic science generally and some of the specific disciplines changed significantly. I came to realize that there was not nearly enough genuine *science* to validate many forensic science disciplines.”⁵⁴

In contrast, Senator Jeff Sessions, a former prosecutor, remarked at

⁴⁸Thomas S. Kuhn, *The Structure of Scientific Revolutions* (1962).

⁴⁹Jose Oreta y Gasset, *The Revolt of the Masses* ch. XIV (1930).

⁵⁰NAS Forensic Science Report, *supra* note 1, at 18.

⁵¹NAS Forensic Science Report, *supra* note 1, at 18. Consequently, “advancing science in the forensic science enterprise is not likely to be achieved within the confines of DOJ.” *Id.*

⁵²Melson, *supra* note 29, at 204.

⁵³Edwards, *supra* note 24, at 7.

⁵⁴Mearns, *supra* note 28, at 430 (emphasis added).

a congressional hearing: "I don't accept the idea that they seem to suggest that fingerprints are not proven technology," and "I don't think we should suggest that those proven scientific principles that we've been using for decades are somehow uncertain."⁵⁵ Although the NAS Report does not say that fingerprint comparison is invalid, it does indicate that uncertainty surrounds the presentation of fingerprint evidence. For example, the report stated the traditional method (ACE-V) is too "broadly stated" to "qualify as a validated method for this type of analysis."⁵⁶ The report added that "[t]he latent print community in the United States has eschewed numerical scores and corresponding thresholds" and consequently relies "on primarily subjective criteria" in making the ultimate attribution decision.⁵⁷ In making the decision, the examiner must draw on personal experience to evaluate numerous factors, including the inevitable variations in pressure, but to date those factors have not been "characterized, quantified, or compared."⁵⁸ At the conclusion of the section devoted to fingerprint analysis, the report outlined an agenda for the research it considered necessary "[t]o properly underpin the process of friction ridge identification."⁵⁹

The NAS Report also commented on testimony concerning error rates. Latent print examiners often testified to a zero error rate. For example, in *United States v. Havvard*,⁶⁰ which involved a *Daubert* challenge to fingerprint evidence, the expert claimed the "error rate for the method is zero." The report responded:

"Although there is limited information about the accuracy and reliability of friction ridge analyses, claims that these analyses have zero error rates are not scientifically plausible."⁶¹

"Some in the latent print community argue that the method itself, if followed correctly . . . has a zero error rate. Clearly, this assertion

⁵⁵Senate Hearing (Sept. 9, 2009), *supra* note 11. Another former prosecutor, Judiciary Committee Chair Senator Patrick Leahy referred to the report as "rather chilling." The Need to Strengthen Forensic Science in the United States: The National Academy of Sciences' Report on a Path Forward: Hearing Before the S. Comm. on the Judiciary, 111th Cong. 5 (2009) (remark of Hon. Patrick J. Leahy during statement of Hon. Harry T. Edwards, Senior Circuit J. and C.J. Emeritus, U.S. Court of Appeals for the D.C. Circuit).

⁵⁶NAS Forensic Science Report, *supra* note 1, at 142.

⁵⁷NAS Forensic Science Report, *supra* note 1, at 141.

⁵⁸NAS Forensic Science Report, *supra* note 1, at 144.

⁵⁹NAS Forensic Science Report, *supra* note 1, at 144.

⁶⁰*U.S. v. Havvard*, 117 F. Supp. 2d 848, 854, 55 Fed. R. Evid. Serv. 1087 (S.D. Ind. 2000).

⁶¹NAS Forensic Science Report, *supra* note 1, at 142.

is unrealistic The method, and the performance of those who use it, are inextricably linked, and both involve multiple sources of error (e.g., errors in executing the process steps, as well as errors in human judgment)."⁶²

C. Judiciary Critiqued

A noteworthy passage in the NAS Report reads: "The bottom line is simple: In a number of forensic science disciplines, forensic science professionals have yet to establish either the validity of their approach or the accuracy of their conclusions, *and the courts have been utterly ineffective in addressing this problem.*"⁶³ "Utterly ineffective" is a devastating condemnation. More so because, in 1993, the U.S. Supreme Court decided *Daubert v. Merrell Dow Pharmaceuticals, Inc.*,⁶⁴ a case that was suppose to address the problem of junk science in the courtroom. In *Daubert*, the Court established a new reliability test for the admissibility of expert testimony, one that emphasized the importance of empirical testing. When *Daubert* was decided, some courts believed that it lowered the barriers to admissibility and thus more expert testimony would be admitted. Yet, over time, the Court transformed the *Daubert* test. By 2000, the Court was referring to the *Daubert* standard as "exacting."⁶⁵

Thus, it was not surprising that the courts' abdication of their gatekeeper role in criminal cases drew the attention of scholars.⁶⁶ In particular, several commentators contrasted the courts' apparent capacity to deal with complex toxic tort litigation with their hands-off policy in criminal litigation. As one scholar noted, "In civil cases, courts seem quite up to the task of evaluating microbiology, teratology, and toxicology evidence Yet when it comes to evaluating the shortcomings of lip prints and handwriting, courts are unable to muster

⁶² NAS Forensic Science Report, *supra* note 1, at 143.

⁶³ NAS Forensic Science Report, *supra* note 1, at 53 (emphasis added).

⁶⁴ *Daubert v. Merrell Dow Pharmaceuticals, Inc.*, 509 U.S. 579, 113 S. Ct. 2786, 125 L. Ed. 2d 469, 27 U.S.P.Q.2d 1200, Prod. Liab. Rep. (CCH) P 13494, 37 Fed. R. Evid. Serv. 1, 23 Envtl. L. Rep. 20979 (1993).

⁶⁵ *Weisgram v. Marley Co.*, 528 U.S. 440, 455, 120 S. Ct. 1011, 145 L. Ed. 2d 958, Prod. Liab. Rep. (CCH) P 15745, 53 Fed. R. Evid. Serv. 406, 45 Fed. R. Serv. 3d 735 (2000).

⁶⁶ See Risinger, *supra* note 27, at 234 ("It is necessary to note one glaring absence from the Committee's explicit recommendations: there is no suggestion to improve admissibility gatekeeping decisions at trial, nor to rely upon them for the improvement of forensic science practice or product. The Committee essentially concludes that the litigation process and the actors in it, lawyers and judges alike, are unqualified to exert any positive influence on forensic science practices through rules of admissibility or otherwise.").

the most minimal grasp of why a standardless form of comparison might lack evidentiary reliability or trustworthiness.”⁶⁷

D. Defense Attorneys

In several articles, defense attorneys are singled out for failing to adequately represent their clients. Judge Nancy Gertner, who has written more groundbreaking decisions in forensic science than any other jurist,⁶⁸ noted that “the NAS Report’s concerns will not be fully met until advocacy changes.”⁶⁹ Other commentators agreed: “Criminal defense lawyers . . . are supposed to be the people who recognize bogus expert claims, challenge them, move to get them excluded, and undermine those that survive exclusion by knowledgeable, thorough, and telling cross-examination. On the whole, they don’t do any of these things very well.”⁷⁰

E. The Forensic Science Profession

One of the more interesting pieces was written by a European and concerns the failure of American forensic science to develop as a scientific discipline: “Most practitioners involved in the analysis of fingerprints, toolmarks, and firearms marks are not scientists and have little, if any, training in science.”⁷¹ The article was written by the Vice-Dean, Faculty of Law and Criminal Sciences, and Director, School of Criminal Sciences, University of Lausanne, Switzerland. This

⁶⁷Moriarty, *supra* note 27, at 315; see also Sanders, *supra* note 28, at 553–54 (“There are many civil law cases in the toxic tort arena where the scientific issues are at least as complex as those in the forensic area. It is true that trial courts, especially state trial courts, have limited time and resources to devote to admissibility issues, but federal district courts confront the same time and resource pressures in civil and criminal cases and still do a more thorough job on the civil side.”); Thompson, *supra* note 7, at 39 (“[T]he NRC analysis fails to explain why the same courts that appear so inept at detecting and excluding problematic forensic testimony in criminal cases are able to enforce the *Daubert* standard far more rigorously in civil cases.”).

⁶⁸See *U.S. v. Hebshie*, 754 F. Supp. 2d 89, 113–15 (D. Mass. 2010) (finding defense counsel ineffective in handling arson experts); *U.S. v. Green*, 405 F. Supp. 2d 104, 109 (D. Mass. 2005) (“The more courts admit this type of toolmark evidence without requiring documentation, proficiency testing, or evidence of reliability, the more sloppy practices will endure; we should require more.”); *U.S. v. Hines*, 55 F. Supp. 2d 62, 67–68, 52 Fed. R. Evid. Serv. 257 (D. Mass. 1999) (limiting admissibility of expert handwriting comparison testimony).

⁶⁹Gertner, *supra* note 26, at 790.

⁷⁰Risinger, *supra* note 27, at 242.

⁷¹Margot, *supra* note 26, at 798 (footnote omitted).

comparative perspective envisions a university-based, rather than a law enforcement, orientation for forensic science.⁷²

One theme running throughout the NAS Report was the need for the forensic science community to develop a “culture of science.”⁷³ Professor Simon Cole, who is known for his path-breaking work on fingerprint comparisons,⁷⁴ provides an insightful piece explicating the phrase “culture of science” from the perspective of the sociology of science. After noting that the NAS Report never says that forensic science is not a “science,” he argues that the terms “science,”⁷⁵ “scientific method,”⁷⁶ and “science culture” are not particularly helpful in addressing the issues confronting forensic science. He then proposes a functional approach, dividing forensic science work into five categories—(1) basic research, (2) evidence collection, (3) techni-

⁷²For another comparative law perspective, see Roach, *supra* note 24 (discussing British and Canadian developments).

⁷³NAS Forensic Science Report, *supra* note 1, at 39. One scholar wrote:

This forensic science culture—a culture in which claims derived from experience are often accepted as a substitute for data; a culture in which interpretations are often framed in absolute terms rather than in more limited or modest language; a culture in which potentially biasing information is not systematically kept from the forensic examiner; and a culture in which institutionally cozy relationships between detectives, forensic analysts, and prosecutors may encourage unconscious partisanship—remains very much the norm within forensic science laboratories today. It is, in the end, this culture that needs to change; new and improved forensic techniques will not, by themselves, provide an adequate solution.

Mnookin, *supra* note 29, at 1215.

⁷⁴E.g., Simon A. Cole, *Suspect Identities: A History of Fingerprinting and Criminal Identification* (2001); Simon A. Cole, *Forensics Without Uniqueness, Conclusions Without Individualization: The New Epistemology of Forensic Identification*, 8 *Law Probability & Risk* 233 (2009); Simon A. Cole, *Is Fingerprint Identification Valid? Rhetorics of Reliability in Fingerprint Proponents' Discourse*, 28 *Law & Pol'y* 109 (2006); Simon A. Cole, *More Than Zero: Accounting for Error in Latent Fingerprint Identification*, 95 *J. Crim. L. & Criminology* 985 (2005).

⁷⁵Cole, *supra* note 28, at 446.

Current philosophy of science views the demarcation problem as unsolved—that is, there is no single definition of “science” that neatly divides everything upon which we want to bestow the title “science” from everything upon which we don't want to bestow that title. The best known purported “solution” to the demarcation problem, Karl Popper's notion of “falsification,” is not viewed by most contemporary philosophers of science as a complete solution: there are areas of study that we generally consider “science” (descriptive biology, geology, etc.) that do not meet the criteria of “falsifiability.”

Id.

⁷⁶Cole, *supra* note 28, 448 (“As one philosopher of science sums it up, ‘there is no scientific method.’”) (quoting Susan Haack, *Not Cynicism, but Synechism: Lessons From Classical Pragmatism*, 41 *Transactions Charles S. Peirce Soc'y* 239, 249 (2005)).

cal management, (4) analysis, and (5) interpretation—and then specifies the qualifications for each category.⁷⁷

Another article is noteworthy for both its proposals and the composition of the group of authors collaborating in its publication.⁷⁸ This article is a multi-disciplinary attempt to address the lack of foundational research in many forensic disciplines:

In our collective opinion, the pattern identification disciplines, as well as other forms of forensic science evidence, must be placed on a more rigorous scientific foundation. More generally, we believe that a significant culture shift is required: Forensic science needs to focus more on science than on law, to shift from a quasi-adversarial perspective to a research orientation. In short, we call for the development and instantiation of what we will term a research culture within forensic science.⁷⁹

These authors state that the “core values” of a scientific culture “are empiricism, transparency, and an ongoing critical perspective.”⁸⁰

The article also considers forensic science publications, noting that many do not satisfy the typical standards of research publication.⁸¹ There is also a discussion of forensic science education.⁸² Further, these authors emphasize the importance of research design⁸³—the technical ability to conduct good research.⁸⁴ In addition, they note the

⁷⁷Cole, *supra* note 28, at 454–59.

⁷⁸The authors include Jennifer L. Mnookin, Simon A. Cole, Itiel E. Dror, Barry A. J. Fisher, Max M. Houck, Keith Inman, David H. Kaye, Jonathan J. Koehler, Glenn Langenburg, D. Michael Risinger, Norah Rudin, Jay Siegel, and David A. Stoney.

⁷⁹Research Culture, *supra* note 6, at 731.

⁸⁰Research Culture, *supra* note 6, at 742.

⁸¹Research Culture, *supra* note 6, at 755–56 (noting that reviewers of some journals are not done blind).

⁸²See also George Sensabaugh & R.E. Gaensslen, Model Standard for Forensic Science Graduate Program, 48 J. Forensic Sci. 460 (2003); David A. Stoney, A Medical Model for Criminalistics Education, 33 J. Forensic Sci. 1086 (1988); Ralph F. Turner, Forensic Science Education—A Perspective, in *Forensic Science* (Geoffrey Davies ed., 1975).

⁸³Research Culture, *supra* note 6, at 749 (“But research does, and must, involve explicit study design. And research reports and publications, comporting with the research culture value of transparency, must be as explicit as is feasible about the nature of the study design.”); *id.* at 742 (“But just as a novice ought not to walk into a forensic science laboratory and begin analyzing casework, neither should forensic practitioners—even those with a bachelor’s degree in a scientific discipline and a master’s degree in forensic science—be expected, or even necessarily encouraged, to develop or execute a research program on their own.”).

⁸⁴Research Culture, *supra* note 6, 744 n.43 (citing a study published in *Forensic Science International*).

failure of some forensic practitioners to engage critics in reasoned rebuttals, rather than *ad hominem* attacks.⁸⁵

F. Validation Studies

Another argument that surfaced in the NAS Report's aftermath concerns validation studies. One commentator observed: "The failure to discover validity studies, however, does not mean the science is invalid."⁸⁶ There are several aspects to this criticism. One aspect questions "the thoroughness of the Committee's research."⁸⁷ For example, "the NAS Report spends . . . six pages on DNA, ten pages on friction ridge analysis, and less than six pages on toolmark and firearms identification. The latter two disciplines have been accepted by courts and relevant scientific communities for decades and have generated many studies, necessitating a more thorough and expansive review than they apparently received by the Committee."⁸⁸

Yet, the NAS Committee's mandate was well known in the forensic science community. "Forensic scientists from all disciplines and from every corner of the nation were awaiting the report."⁸⁹ Anyone could submit papers to the committee. Moreover, as noted above, forensic science was well represented on the committee and many forensic disciplines made presentations before the committee.⁹⁰ In addition, the NAS's review process was comprehensive.⁹¹

For decades, legal scholarship has been stressing the lack of empirical research in some forensic disciplines.⁹² If these scholars overlooked so much research, one would expect that federal prosecutors would

⁸⁵ Research Culture, *supra* note 6, at 753; see also Cole, Fordham Urb. L.J., *supra* note 29, at 442 n.49 (listing examples).

⁸⁶ Melson, *supra* note 29, at 222; see also House Hearing (May 13, 2009), *supra* note 11, at 5 (statement of Kenneth Melson); *id.* at 17 (statement of Peter M. Marone) (stating that "'not validated' . . . does not mean 'of no value'").

⁸⁷ Melson, *supra* note 29, at 197-98.

⁸⁸ Melson, *supra* note 29, at 222 (footnotes omitted).

⁸⁹ Melson, *supra* note 29, at 197.

⁹⁰ See NAS Forensic Science Report, *supra* note 1, at app. A (listing committee members and their biographies) & app. B (listing meetings and agenda of each meeting).

⁹¹ See NAS Forensic Science Report, *supra* note 1, at xiii (listing twenty-five reviewers).

⁹² See Randolph N. Jonakait, Forensic Science: The Need for Regulation, 4 Harv. J. L. & Tech. 109, 137 (1991) ("Forensic science is supported by almost no research. The laboratory practices are based on intuitions and deductions, not on empirical proof." (footnote omitted)); D. Michael Risinger et al., Exorcism of Ignorance as a Proxy For Rational Knowledge: The Lessons of Handwriting Identification "Expertise," 137 U. Pa. L. Rev. 731, 738 (1989) ("Our literature search for empirical evaluation of

bring this research to light during *Daubert* challenges. They did not.⁹³ Judge Edwards would later comment:

One of the most telling moments for me during the Committee's hearings occurred when I heard the testimony of an expert fingerprint analyst who is a member of the Scientific Working Group on Friction Ridge Analysis, Study, and Technology. At one point in his testimony, he was asked what was the scientific basis for determining a "match" in prints in situations when the examiner has only a partial or smudged print. The expert did not hesitate in conceding that the "research has yet to be done." Last April at a major conference on forensic science at Arizona State University, the Director of the National Institute of Justice [NIJ] was asked why NIJ had not funded any serious studies to determine the validity of fingerprint analyses. He acknowledged the dearth of research and urged everyone to be patient as NIJ tried to develop some "foundational studies."⁹⁴

Validation studies that are not published are virtually useless. Studies published in practitioner journals that lack wide distribution in scientific circles raise numerous issues: Was there role bias? Was the research design valid? It is much easier to conduct a bad study than a good one.

G. Admissibility

At the congressional hearings, the Department of Justice representative stated that "the report does not take the position that any of the forensic disciplines is scientifically invalid" but merely "highlights the lack of research and other scientific validation methods within several disciplines."⁹⁵ This comment begs the question: How can validity be established without validation studies?

handwriting identification turned up one primitive and flawed validity study from nearly 50 years ago, one 1973 paper that raises the issue of consistency among examiners but that presents only uncontrolled impressionistic and anecdotal information not qualifying as data in any rigorous sense, and a summary of one study in a 1978 government report. Beyond this, nothing." (footnotes omitted)); Michael J. Saks & Jonathan J. Koehler, What DNA "Fingerprinting" Can Teach the Law About the Rest of Forensic Science, 13 Cardozo L. Rev. 361, 372 (1991) ("[F]orensic scientists, like scientists in all other fields, should subject their claims to methodologically rigorous empirical tests. The results of these tests should be published and debated. Until such steps are taken, the strong claims of forensic scientists must be regarded with far more caution than they traditionally have been.").

⁹³See Giannelli, *supra* note 29 (discussing the manipulation of forensic studies).

⁹⁴Honorable Harry T. Edwards, Presentation at the Superior Court of the District of Columbia Conference on The Role of the Court in an Age of Developing Science & Technology: The National Academy of Sciences Report on Forensic Sciences: What it Means for the Bench and Bar (May 6, 2010), at 8 (footnote omitted) [hereinafter Judge Edwards's Address].

⁹⁵House Hearing (May 13, 2009), *supra* note 11, at 13 (statement of Kenneth Melson).

Some prosecutors went further in court briefs, arguing that Judge Edwards had stated that the NAS Report was not intended to affect admissibility decisions.⁹⁶ He responded: "I most certainly never said, or even suggested, that judges should not take into account the new information provided by the Report in assessing the validity and reliability of forensic evidence while making admissibility determinations. Claims to the contrary are without basis in fact and utterly absurd."⁹⁷ Indeed, Judge Edwards went on to cite Judge Gertner's approach as "reasonable and balanced."⁹⁸ In a recent order, Judge Gertner noted that, although the NAS Report did not speak to admissibility in a given case, "it raised profound questions that need to be carefully examined in every case prior to trial." These include:

(1) the extent to which a particular forensic discipline is founded on a reliable scientific methodology that gives it the capacity to accurately analyze evidence and report findings and (2) the extent to which practitioners in a particular forensic discipline rely on human interpretation that could be tainted by error, the threat of bias, or the absence of sound operational procedures and robust performance standards.⁹⁹

She went on to elaborate:

The Report noted that these fundamental questions have not been "satisfactorily dealt with in judicial decisions pertaining to the admissibility" of evidence . . . In the past, the admissibility of this kind of evidence was effectively presumed, largely because of its pedigree—the fact that it had been admitted for decades. As such, counsel rarely challenged it, and if it were challenged, it was rarely excluded or limited. The NAS report suggests a different calculus—that admissibility of such evidence ought not to be presumed; that it has to be carefully examined in each case, and tested in the light of the NAS concerns, the concerns of *Daubert/Kumho* case law, and Rule 702 of the Federal Rules of Evidence.¹⁰⁰

Judge Edwards also addressed the standards use in forensic science.

⁹⁶ See, e.g., Government's Opposition to Defendant's Motion to Exclude Expert Testimony Concerning Latent Fingerprint Evidence at 3, *United States of America v. Titus Faison*, No. 2008-CF2-16636 (D.C. Super. Ct. Feb. 19, 2010) ("[T]he NRC Forensic Science Report does not support the conclusion that fingerprint evidence is inadmissible under the *Frye* calculus. In fact, the Honorable Harry T. Edwards, Co-Chair for the NRC Forensic Science Report, has stated on the public record that the report is not intended to affect the admissibility of any forensic evidence.").

⁹⁷ Judge Edward's Address, *supra* note 94, at 4.

⁹⁸ Judge Edward's Address, *supra* note 94, at 6.

⁹⁹ Procedural Order: Trace Evidence at 2, *United States v. Oliveira*, No. 1:08-cr-10104-NG (D. Mass. Mar. 8, 2010) (quoting NAS Report) (internal citations omitted), available at <http://www.swgfast.org/Resources/100310-GertnerProceduralOrder.pdf> [hereinafter *Procedural Order*].

¹⁰⁰ Procedural Order, *supra* note 99, at 2–3.

Commenting on the value of scientific working groups (SWGs), he pointed out that:

- SWG committees meet irregularly and have no clear or regular sources of funding.
- There are no clear standards in place to determine who gains membership on SWG committees.
- Neither SWGs nor their recommendations are mandated by any federal or state law or regulation.
- SWG recommendations are not enforceable.
- A number of SWG guidelines are too general and vague to be of any great practical use.
- SWG committees have no way of knowing whether state or local agencies even endorse the standards.
- Complaints are not filed when a practitioner violates an SWG standard.
- SWG committees do not attempt to measure the impact of their standards by formal study or survey.¹⁰¹

"In other words, there is nothing to indicate that the standards are routinely followed and enforced in a way to ensure best practices in the forensic science community."¹⁰²

I. Conclusion

According to Judge Edwards, "I think that the most important part of our Committee's Report is its call for real science to support the forensic disciplines."¹⁰³

¹⁰¹ Judge Edwards' Address, *supra* note 94, at 9.

¹⁰² Judge Edwards' Address, *supra* note 94, at 9.

¹⁰³ Judge Edwards' Address, *supra* note 94, at 7.