

A TEMPLATE FOR ENHANCING THE IMPACT OF THE NATIONAL ACADEMY OF SCIENCES' REPORTING ON FORENSIC SCIENCE

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Abstract

The National Academy of Sciences (NAS), established in 1863, is the United States' leading science and technology think-tank, with an active commitment to advising government. Over the last 150 years, the NAS has, both independently and in conjunction with the federal government, investigated and reported on various issues of importance, ranging from space exploration and biosecurity, to STEM education and immigration. Due to growing concerns about particular disciplines (and specifically their application in legal proceedings), one issue the NAS has reported on between 1992 and 2009 is forensic science. Specifically, the NAS has published six reports commenting on the status of forensic science evidence in the USA, namely *DNA Technology in Forensic Science* (1992), *The Evaluation of Forensic DNA Evidence* (1996), *The Polygraph and Lie Detection* (2003), *Forensic Analysis: Weighing Bullet Lead Evidence* (2004), *Ballistic Imaging* (2008), and *Strengthening Forensic Science in the United States: A Path Forward* (2009). The response of stakeholders (including from political, legal, and academic spheres) to these reports has varied, ranging from shifts in practice and full acknowledgement, to considerable struggles to effectuate systemic reform. Using the different experiences of two reports - *Forensic Analysis: Weighing Bullet Lead Evidence* (2004) and *Strengthening Forensic Science in the United States: A Path Forward* (2009) - as a vehicle, this article suggests how the NAS can strengthen the impact of its forensic science reporting, and how stakeholders can better harness the expertise of the NAS.

Introduction

DNA technology – when applied properly - provides the criminal justice system with a highly reliable identification method, which can be used to both convict and exonerate individuals. At the same time, however, this quality, undermines various forensic science identification techniques, including tool-mark, fingerprint, and bite-mark analysis, which the criminal justice system has routinely admitted as evidence for decades.¹ The federal government and the National Academy of Sciences (NAS) – the United States' leading science and technology think-tank - have recognized this. In 1992 and 1996, following the introduction of DNA evidence into legal proceedings,² the NAS, supported by federal funding,³ published two reports on the forensic use of DNA technology. In these reports, the NAS encouraged the criminal justice system to harness DNA technology - when conducted according to approved procedures - due to its evidence-based high reliability.⁴ Subsequently, federal bodies commissioned the NAS to report on the probative value of other, non-DNA forensic science techniques.⁵ This resulted in the publication of four reports: *The Polygraph and Lie Detection – 2003*⁶; *Forensic Analysis: Weighing Bullet Lead Evidence – 2004*⁷; *Ballistic Imaging – 2008*⁸; and *Strengthening Forensic Science in the United States: A Path Forward – 2009*.⁹ Generally, these reports provide an examination of the reliability and validity of the relevant forensic science discipline(s), and include recommendations to the commissioning body. The response of stakeholders to these reports has varied, ranging from shifts in practice, and clear acknowledgements, to silence and considerable struggle to effectuate systemic forensic science reform.

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The authors would like to thank participants at the *Conference on American Politics, History and Law: A Cross-Disciplinary Dialogue* sponsored by Birmingham City University's Centre for American Legal Studies and The Monroe Centre at the University of Reading in July, 2018 for their feedback on Ms. Shooter's presentation that led to this article; Professor Lissa Griffin for her valuable feedback on an earlier draft; and Dr Ilaria Di Gioia (and the wider BJALS team) for inviting us to contribute to this special edition.

¹ See, in general, Paul C. Giannelli, *Forensic Science: Under the Microscope* 34 Ohio N. U. L. Rev. 315 (2008).

² *R v. Pitchfork* [2009] EWCA (crim.) 963, [11] (Eng.); *Andrews v. State* 533 So.2d 841 (Fla. Dist. Ct. App. 1988).

³ VICTOR A. MCKUSICK ET AL., *DNA TECHNOLOGY IN FORENSIC SCIENCE* (1992); JAMES F. CROW ET AL., *THE EVALUATION OF FORENSIC DNA EVIDENCE* (1996).

⁴ *Id.*

⁵ The report, *The Polygraph and Lie Detection* (2003) was commissioned by the United States Department of Energy, *Forensic Analysis: Weighing Bullet Lead Evidence* (2004) was commissioned by the FBI, *Ballistic Imaging* was commissioned by the National Institute of Justice, and *Strengthening Forensic Science in the United States: A Path Forward* (2009) was commissioned by Congress.

⁶ STEPHEN E. FEINBERG, *THE POLYGRAPH AND LIE DETECTION* (2003).

⁷ KENNETH O. MACFADDEN ET AL., *FORENSIC ANALYSIS: WEIGHING BULLET LEAD EVIDENCE* (2004).

⁸ DANIEL L. CORK ET AL., *BALLISTIC IMAGING* (2008).

⁹ HARRY T. EDWARDS, CONSTANTINE GATSONIS ET AL., *STRENGTHENING FORENSIC SCIENCE IN THE UNITED STATES: A PATH FORWARD* (2009).

This article, using the experiences of *Forensic Analysis: Weighing Bullet Lead Evidence (CBLA Report)* and *Strengthening Forensic Science in the United States: A Path Forward (Strengthening)* as a vehicle, explores how the NAS can strengthen the impact of its forensic science reporting, and, how stakeholders can better harness the expertise of the NAS in this context. These reports have been selected because of the clearly identifiable and diverse spectrum of responses they have drawn. Part I briefly outlines the function and research portfolio of the NAS and details the circumstances surrounding the publication of both the *CBLA Report* and *Strengthening*. This includes the findings of those reports and stakeholder responses to/associated with the reports, including those by the FBI, Department of Justice, Congress, the judiciary, state legislatures, and the White House. Part II identifies themes in the experiences of these reports, using them to shape a template that can – the authors suggest - be used to strengthen the NAS’ forensic science reporting and enable stakeholders to better harness the expertise of the NAS. Part III concludes that the template will enable the NAS to take a lead role in increasing public confidence in the criminal justice system by facilitating cross-stakeholder collaboration, and by publicly normalizing and explaining the nature of the scientific method, progress, findings, and uncertainty. This role aligns neatly with the NAS’ unique history, function, and mission.

PART I: THE NATIONAL ACADEMY OF SCIENCES AND SELECTED REPORTS ON FORENSIC SCIENCE

This section first outlines the history and function of the NAS. It then details the circumstances surrounding the publication of the *CBLA Report* and *Strengthening*, including the findings of those reports and the responses drawn from stakeholders.

a. Function and Research Portfolio of the NAS

In 1863, the NAS was established by President Lincoln to provide “independent, objective advice to the nation on matters related to science and technology.”¹⁰ The NAS is now considered to be the United States’ premier scientific research center, with a statutory mandate to “... report upon any subject of science...” when called upon by the federal government.¹¹ It is a “private, non-profit society of distinguished scholars,”¹² with its members elected by their peers “for outstanding contributions to research.”¹³ The NAS’ Mission Statement states it is “committed to furthering science in America”¹⁴, although its members are also notably “active contributors to the international scientific community.”¹⁵

Over the last 150 years, the NAS has generated a diverse portfolio of research that reflects the culture of scientific collaboration and inquiry. This portfolio includes reporting on matters of

¹⁰ National Academy of Sciences, *Mission*, <http://www.nasonline.org/about-nas/mission/> (last visited Dec. 9, 2018).

¹¹ An Act to Incorporate the National Academy of Sciences, 36 U.S.C §251 et seq. (1863).

¹² National Academy of Sciences, *supra* note 10.

¹³ *Id.*

¹⁴ *Id.*

¹⁵ *Id.*

national security and welfare during World War I;¹⁶ exploring warfare technology in World War II;¹⁷ mapping side effects of atomic warfare and participating in international scientific exchanges¹⁸ during the Cold War¹⁹; and, more recently, reporting on education, population growth, climate change, and forensic science.²⁰ During this time, the NAS has experienced evolving, challenging and productive relationships with various stakeholders, including the federal government, states, and scholars.²¹ This article focuses on stakeholder responses to two of the NAS's forensic science reports, namely the *CBLA report* and *Strengthening*. Subsection (b) provides relevant details about these reports.

b. *The CBLA Report and Strengthening: Report Overviews and Stakeholder Responses*

Forensic Analysis: Weighing Bullet Lead Evidence (CBLA Report)

In the mid-twentieth century, Comparative Bullet-Lead Analysis (CBLA) was developed by the FBI as a tool to determine the source of bullet fragments found at crime scenes.²² The technique, exclusively used by the FBI,²³ involves examiners comparing the chemical composition of a bullet fragment to suspect-related bullets.²⁴ Typically, examiners analyze the ratio between seven chemical elements, and find a match if the chemical make-up of the two samples are sufficiently similar.²⁵

¹⁶ ALBERT L. BARROWS, *THE RELATIONSHIP OF THE NATIONAL RESEARCH COUNCIL TO INDUSTRIAL RESEARCH*, in *RESEARCH – A NATIONAL RESOURCE: II – INDUSTRIAL RESEARCH* 365 (1940).

¹⁷ *Id.* at 396-397.

¹⁸ The government also made use of the NAS through a series of scientific exchanges between both the USSR and China. This proved to be valuable for international relations, with science maintaining dialogue between nations when political relations had broken down.

¹⁹ During the Cold War period, the NAS and NRC worked on a variety of research projects for the federal government, including oceanography, studies of pacific islands and improving international scientific dialogue and cooperation. As popular interest in subjects such as the effect of atomic warfare increased, the NAS was used by the federal government to map its effects.

²⁰ *See, e.g.*, GEORGE B. KISTIAKOWSKY, *FEDERAL SUPPORT OF BASIC RESEARCH IN INSTITUTIONS OF HIGHER LEARNING* (1964); WILLIAM D. McELROY, *THE GROWTH OF WORLD POPULATION: ANALYSIS OF THE PROBLEMS AND RECOMMENDATIONS FOR RESEARCH AND TRAINING* (1963).

²¹ For example, the report, ALAN LESHNER, *COMMUNICATING SCIENCE EFFECTIVELY* (2017) was funded by a collection of private organizations, namely the Burroughs Wellcome Fund, the Rita Allen Foundation, the Gordon and Betty Moore Foundation, and the Hewlett Foundation.

²² KENNETH O. MACFADDEN ET AL., *supra* note 7, at 1.

²³ William C. Thompson, *Analyzing the Relevance and Admissibility of Bullet-Lead Evidence: Did the NRC Report Miss the Target*, 46 *JURIMETRICS* 65, 66 (2005-2006).

²⁴ KENNETH O. MACFADDEN ET AL., *supra* note 7, at 8, 19-20.

²⁵ *Id.*

In 2002, the FBI commissioned the NAS to produce “an impartial scientific assessment of the soundness of the scientific principles underlying CBLA²⁶ to determine the optimum manner for conducting the examination and to establish scientifically valid conclusions.”²⁷ This followed publication of the concerns of former FBI metallurgist, William Tobin, about the scientific basis for CBLA.²⁸ This was the first time that CBLA evidence had received such scrutiny.²⁹

In 2004, the NAS published its report *Forensic Analysis: Weighing Bullet Lead Evidence*. The report detailed the analytical method used by FBI examiners,³⁰ and criticized much of the FBI’s reporting procedures for incompleteness and lack of detail.³¹ Despite this, it recognized the FBI process as appropriate for determining the chemical composition of bullet lead.³² It discussed several methods for the statistical analysis of CBLA evidence, including error rates.³³ The NAS found that the methods used by the FBI insufficiently appreciated the variability of bullets, both within the bullet population and differences in manufacturing processes.³⁴ The report concluded and recommended to the FBI that the statistical procedures used to assess a match should employ standard deviations and be charted regularly. It also recommended that all examiners follow official FBI protocol(s) for CBLA, including properly maintaining documentation.³⁵

The NAS also found that variations in manufacturing processes could undermine the probative value of CBLA evidence and potentially result in misleading comparisons.³⁶ It recommended that further research be carried out to define different ranges of indistinguishable lead.³⁷ The NAS also identified issues relating to the interpretation of CBLA evidence.³⁸ This

²⁶ Throughout the report, CBLA evidence is referred to as CABL, or comparative analysis of bullet lead.

²⁷ KENNETH O. MACFADDEN ET AL, *supra* note 7 at ix.

²⁸ Erik Randich, Wayne Duerfeldt, Wade McLendon, William Tobin, *A Metallurgical View of the Interpretation of Bullet Lead Compositional Analysis* FORENSIC SCIENCE INTERNATIONAL 127, 174-191 (2002).

²⁹ KENNETH O. MACFADDEN ET AL, *supra* note 7, at 101.

³⁰ *Id.* at 15.

³¹ *Id.* at 16.

³² *Id.* at 23.

³³ *Id.* at Chapter 3.

³⁴ *Id.* at 68.

³⁵ *Id.* at 68-70.

³⁶ *Id.* at 98.

³⁷ *Id.* at 106.

³⁸ *Id.* at 107.

led them to recommend a more rigorous analysis process,³⁹ and to caution the FBI that its analytical protocol needed revision to provide more clarity.⁴⁰ The NAS, however, did not recommend that CBLA evidence be inadmissible in legal proceedings.⁴¹

Stakeholder Responses

This report primarily elicited responses from two stakeholder groups: the FBI and the judiciary.

FBI Response

Immediately after the report's publication, the FBI defended its use of CBLA, but expressed a willingness to undertake further research.⁴² However, in September 2005, the FBI published a press release stating that "after extensive study and consideration,"⁴³ it would "no longer conduct the examination of bullet lead."⁴⁴ The FBI stated that it "firmly support[s] the scientific foundation"⁴⁵ of CBLA, but decided to discontinue CBLA due to costs associated with improvements, and that "neither scientists nor bullet manufacturers are able to definitely attest to the significance of an association...in the course of a bullet lead examination."⁴⁶

At the time of the FBI's decision, over 2,500 convictions had been secured using the CBLA technique.⁴⁷ This attracted media attention (including from *60 Minutes* and the *Washington Post*)⁴⁸, which urged the FBI to review relevant convictions.⁴⁹ Ultimately, the FBI partnered

³⁹ *Id.* at 107-108.

⁴⁰ *Id.* at 109-10.

⁴¹ *Id.* at 107.

⁴² Charles Piller, *Report Finds Flaws in FBI Bullet Analysis*, *LA Times*, 2004 <http://articles.latimes.com/2004/feb/11/science/sci-bullet11> (last visited Dec. 9, 2018).

⁴³ FBI National Press Office, *FBI Laboratory Announces Discontinuation of Bullet Lead Examinations* (Sept. 1, 2005) <https://archives.fbi.gov/archives/news/pressrel/press-releases/fbi-laboratory-announces-discontinuation-of-bullet-lead-examinations>.

⁴⁴ *Id.*

⁴⁵ *Id.*

⁴⁶ *Id.*

⁴⁷ *Id.*

⁴⁸ See, CBS, *Evidence of Injustice*, YOUTUBE (Sep. 14, 2008) <https://www.youtube.com/watch?v=H4g62cpRz7M> (last visited Dec. 9, 2018).

⁴⁹ CBS News, *Evidence of Injustice*, 2007 <https://www.cbsnews.com/news/evidence-of-injustice/> (last visited Dec. 9, 2018).

with the Innocence Project, and Department of Justice to conduct such a review.⁵⁰ There is limited information available about outcome of this review.⁵¹

Judicial Response

The *CBLA Report* has also been referenced in judicial decisions. Individuals have appealed convictions (with or without a FBI review letter)⁵² on the basis that the *CBLA Report* constitutes newly discovered evidence.

Newly discovered evidence claims “usually involve some combination of showings that the new evidence could not have been discovered prior to trial with the exercise of reasonable diligence; that the evidence is relevant and not cumulative or merely impeaching; and that the new evidence creates a sufficient probability of a different result at a new trial.”⁵³ Petitioners have used this mechanism to argue that the *CBLA report* is new evidence capable of undermining the trial result.

Some petitions have succeeded in cases where CBLA evidence was the primary evidence against the petitioner. For example, in *Ward v State*, the Court of Special Appeals of Maryland held that various pieces of evidence coming to light after trial (including the NAS report) constituted newly discovered evidence and vacated the petitioner’s conviction.⁵⁴ Similarly, in *Murphy v State* the court also agreed that the NAS report constituted newly discovered evidence, as the report’s findings were not discoverable at trial, leading the court to reverse the conviction.⁵⁵

By contrast, other courts have determined that the *CBLA Report* is not newly discovered evidence. This has been for various reasons, including that CBLA’s loss of ‘general acceptance’ neither affects previous decisions in the case,⁵⁶ nor renders trials fundamentally unfair.⁵⁷ Another reason is the court’s conclusion that in the individual case the limitations of CBLA had been brought to the jury’s attention during cross-examination.⁵⁸ In *More v State*, for example, the Supreme Court of Iowa recognized the report as a “blockbuster” constituting newly

⁵⁰ FBI National Press Office, *FBI Laboratory to Increase Outreach in Bullet Lead Cases* (Nov. 17, 2007) <https://archives.fbi.gov/archives/news/pressrel/press-releases/fbi-laboratory-to-increase-outreach-in-bullet-lead-cases>.

⁵¹ Intel Today, *Forensic Science – FBI Bullet-Lead Technique Dead* (Apr. 29, 2018) [Wrong](https://gosint.wordpress.com/2018/04/29/forensic-science-fbi-bullet-lead-technique-dead-wrong/)<https://gosint.wordpress.com/2018/04/29/forensic-science-fbi-bullet-lead-technique-dead-wrong/>. This blog post, for example, notes that freedom of information requests about the review have not been answered.

⁵² The FBI, as part of a review of CBLA cases, sent letters to individuals affected to make them aware of the limitations of the evidence.

⁵³ Keith A. Findley, *Defining Innocence*, 74 ALB. L. REV. 1157, 1197 (2010).

⁵⁴ *Ward v. State* 221 Md.App. 146 (Md. Ct. Spec. App. 2015).

⁵⁵ *Murphy v. State* 24 So.3d 1220 (Fla. Dist. Ct. App. 2009).

⁵⁶ *Commonwealth v. Kretchmar* 971 A.2d 1249 (Pa. 2009).

⁵⁷ *Gonzales v. Thaler*, 2012 WL 5462682 (S.D. Tex. Oct 23, 2012).

⁵⁸ *United States v. Higgs* 663 F.3d 726 (D. Md. 2010).

discovered evidence,⁵⁹ but did not find fundamental unfairness in the trial, as the defendant did not suffer actual prejudice.⁶⁰ Similarly, the Kentucky Supreme Court in *St Clair v Commonwealth*, determined that although CBLA evidence is no longer admissible, it does not go so far as to justify a new trial, as the CBLA expert conceded that the evidence was not infallible.⁶¹

Another identifiable approach in rejecting newly discovered evidence claims emerges where a conviction was supported by other, non-CBLA evidence. In such cases, judges have reasoned that, due to the presence of other inculpatory evidence, the exclusion or undermining of CBLA evidence would not have resulted in a different trial outcome. For example, the Supreme Court of Minnesota dismissed the petitioner's claim in *Gassler v State*, deciding that the additional evidence presented to the jury at trial meant that removing CBLA evidence would have no effect on the jury's decision.⁶²

2. *Strengthening Forensic Science in the United States: A Path Forward*

In 2005, Congress commissioned the NAS to report on the general status of forensic science after recognizing that “significant improvements are needed in forensic science.”⁶³ The report aimed to “chart an agenda for progress in the forensic science community and its scientific disciplines.”⁶⁴ To do this, the NAS engaged in a comprehensive consultation with stakeholders and experts.⁶⁵ The evidence received by the NAS was “detailed, complex, and sometimes controversial.”⁶⁶ In its report, therefore, the NAS decided to “reach a consensus on the most important issues,” and offer specific recommendations for them.⁶⁷

Strengthening was published in 2009, reporting on forensics in general and on individual forensic science disciplines in particular. The overall finding of the report was that the forensic science sector was fragmented and under-resourced,⁶⁸ which limited its potential to effectively service stakeholders.⁶⁹ The NAS recommended that Congress create an independent

⁵⁹ *More v. State* 880 N.W.2d 487, 509 (Iowa 2016).

⁶⁰ *Id.* at 512-513.

⁶¹ *St Clair v. Commonwealth* 451 S.W.3d 597 (Ky. 2014).

⁶² *Gassler v. State* 787 N.W.2d 575 (Minn. 2010).

⁶³ HARRY T. EDWARDS, CONSTANTINE GATSONIS ET AL., *supra* note 9, at xix.

⁶⁴ *Id.* at xix.

⁶⁵ *Id.* at 2.

⁶⁶ *Id.* at 4.

⁶⁷ *Id.*

⁶⁸ *Id.* at 77-78.

⁶⁹ *Id.*

oversight body to monitor the implementation of the report's recommendations,⁷⁰ which were designed to improve⁷¹ adherence to standards and provide forensic science education.

With regards to specific disciplines, the report evaluated each discipline's adherence to fundamental scientific principles.⁷² This included: biological evidence;⁷³ drug and controlled substance analysis;⁷⁴ friction ridge analysis (fingerprints);⁷⁵ other pattern and impression evidence;⁷⁶ toolmark and firearms identification evidence;⁷⁷ microscopic hair evidence;⁷⁸ fiber evidence;⁷⁹ document examination ;⁸⁰ paint and coatings evidence;⁸¹ explosives evidence and fire debris;⁸² forensic odontology (bite impressions);⁸³ bloodstain pattern analysis;⁸⁴

⁷⁰ *Id.* at 80.

⁷¹ *Id.* at 217.

⁷² *Id.* from 112.

⁷³ The report examines blood stain, and other biological fluid evidence, concluding that nuclear DNA analysis is the most reliable way of attributing fluids to individuals, but other DNA analysis methods are available. As DNA developed through scientific methods, analysis is highly reliable. *Id.* at 128-133.

⁷⁴ The report demonstrates concerns that appropriate standards and recommendations are not followed, as they cover a range of drugs – it is the analyst's responsibility to decide the appropriate testing method. This is problematic as drug analysis reports are often inadequate. *Id.* at 133-136.

⁷⁵ In acknowledging the utility of fingerprint analysis, the report refuted claims of a zero error rate. They found limited research supporting reliability of analysis techniques and individualization of prints, recommending further research. *Id.* at 136-145.

⁷⁶ The report found experts find it difficult to avoid bias, and that the experience-reliant nature of impression matching rendered the imposition of standards difficult. Further research to understand the rarity of characteristics was recommended. *Id.* at 145-150.

⁷⁷ In concluding, the report determined that not enough is known about toolmark variability, meaning that it is impossible to set a confidence level. They also showed concern about a lack of defined analysis process and difficulties with experts' qualitative reasoning. *Id.* at 150-155.

⁷⁸ The report did not find any scientifically accepted statistics about frequency distribution of hair characteristics, and analysts' conclusions are often inaccurate, calling testimony "highly unreliable." *Id.* at 155-161.

⁷⁹ No studies were found supporting methods of matching hair fibers, leaving a determination of a match ambiguous as to its probative value. *Id.* at 161-163.

⁸⁰ The report concluded that the scientific basis of document examination needs strengthening, as limited research has been carried out. *Id.* at 163-167.

⁸¹ While based on solid foundation of chemistry, the report showed concerns about the lack of standard practices for determining a match of two samples. *Id.* at 167-170.

⁸² The report supported the chemistry-based foundations of explosives evidence, but found very little research into burn patterns, leaving expert opinions unsupported. *Id.* at 170-173.

⁸³ The reliability of bite mark evidence was refuted, with the report rejecting the methods used by analysts to identify individuals based on dental impressions. In addition, no studies have been carried out supporting the use of this technique. *Id.* at 173-176.

⁸⁴ Some aspects of bloodstain pattern analysis are supported by studies, but is resource intensive, especially if analysts wish to provide causal links. *Id.* at 177-179.

and digital and multimedia analysis.⁸⁵ The NAS found that these techniques varied in their reliability and underpinning research,⁸⁶ and that several techniques “do not contribute as much to criminal justice as they could.”⁸⁷ Ultimately, the NAS concluded that “with the exception of nuclear DNA analysis... no forensic method has been rigorously shown to have the capacity to consistently, and with a high degree of certainty, demonstrate a connection between evidence and a specific individual or source.”⁸⁸ This was hailed as a landmark and unprecedented conclusion.⁸⁹

Although the NAS did not make prescriptive comments on the admissibility of forensic techniques, it discussed what it saws as inadequacies in legal admissibility standards.⁹⁰ Its findings were particularly critical of judicial decision-making under *Daubert*,⁹¹ which requires judges – as part of their gate-keeping role - to consider error-rates, professional standards, general acceptance, testability, and peer review of disciplines to determine the admissibility of expert evidence. The NAS stated, that “the present situation... is seriously wanting”⁹² and that “*Daubert* has done little to improve the use of forensic science evidence in criminal cases.”⁹³

Stakeholder Responses

Ten years post-publication, a significant body of literature discussing *Strengthening* exists.⁹⁴ Most recently, co-chairs of the committee that authored *Strengthening*, Harry T. Edwards and Constantine Gatsonis, were awarded the Innocence Network's 2018 Champion of Justice Award. The Innocence Project thanked the committee for the report, stating it "has truly transformed the state of forensic science and the involvement of the research community in service of criminal justice reform."⁹⁵ Over the last decade, the critical messages of *Strengthening* have attracted various stakeholder responses, including from Congress, state legisla-

⁸⁵ The report acknowledges the emerging nature of this field, acknowledging its potential to collect vast amounts of information. Greater training amongst police officers is needed. *Id.* at 179-182.

⁸⁶ HARRY T. EDWARDS, CONSTANTINE GATSONIS ET AL, *supra* note 9, at 182.

⁸⁷ *Id.* at 183.

⁸⁸ *Id.* at 7.

⁸⁹ D. Michael Risinger, *The NAS/NRC Report on Forensic Science: A Path Forward Fraught with Pitfalls*, 2010 UTAH L. REV. 225, 225-226 (2010).

⁹⁰ HARRY T. EDWARDS, CONSTANTINE GATSONIS ET AL, *supra* note 9, at 86-95.

⁹¹ *Id.* at 107-109.

⁹² *Id.* at 110.

⁹³ *Id.* at 106.

⁹⁴ A literature review searching *Strengthening Forensic Science in the United States: A Path Forward* has produced 391 results. This was carried out in 2018. This catalogue is on file with the authors.

⁹⁵ The National Academies of Sciences, Engineering and Medicine, *Co-Chairs of Forensic Science Report Honored by Innocence Network*, Apr. 12, 2019, <http://www8.nationalacademies.org/onpinews/newsitem.aspx?RecordID=4122019>.

tures, the judiciary, the Department of Justice, FBI, and White House. These are summarised below.

Congress

The report's recommendations, including the creation of the oversight body - nominally called the National Institute of Forensic Science - were naturally directed towards Congress. In 2009, the House of Representatives Committee on Science and Technology discussed how *Strengthening's* findings and recommendations would relate to the work of the National Institute of Standards and Technology.⁹⁶ The Senate Judiciary Committee discussed the report's findings in the light of a 2009 United States Supreme Court decision – *Melendez-Diaz v Massachusetts*.⁹⁷ In that case the Court had, citing *Strengthening*, commented that forensic science was subject to “serious deficiencies.”⁹⁸ Noting this comment, the Senate Judiciary Committee took evidence from various stakeholders, including the Innocence Project,⁹⁹ police,¹⁰⁰ academics,¹⁰¹ and attorneys.¹⁰² The discussion ultimately identified concerns about the resources required to implement reform, with post-hearing submissions highlighting the need for financial and organizational re-structuring of the forensic science sector.¹⁰³ This prompted discussion about the feasibility of reforms,¹⁰⁴ and to date Congressional efforts to introduce comprehensive legislative reform have faced significant challenges.¹⁰⁵ Despite this, existing DNA-based initiatives have continued to receive funding. For example, the Debbie Smith Act was re-authorized in 2014, providing \$968 million over the 2015-2019 period to assist the Department of Justice in clearing DNA backlogs.¹⁰⁶ With the cost of creating and maintaining forensic science standards being a decisive factor, Congress' ability to enact meaningful systemic reform has been questioned.¹⁰⁷

State Legislatures

⁹⁶ S. Rep. No. 111-8 (2009).

⁹⁷ *Melendez-Diaz v. Massachusetts* 557 U.S. 305 (2009).

⁹⁸ *Id.*

⁹⁹ S. Rep. No. 111-554, at 8 (2009).

¹⁰⁰ *Id.* at 10.

¹⁰¹ *Id.* at 12.

¹⁰² *Id.* from 14.

¹⁰³ *Id.* at 38-39.

¹⁰⁴ *Id.* at 38.

¹⁰⁵ See, e.g., Forensic Science and Standards Act of 2012, S. 3378, 112th Cong. (2012).

¹⁰⁶ Debbie Smith Reauthorization Act of 2014, H.R. 4323, 113th Cong., at 5 (2014).

¹⁰⁷ See, e.g., Eric Maloney, *Two More Problems and Too Little Money: Can Congress Truly Reform Forensic Science*, 14 MINN. J. L. SCI. & TECH. 923 (2013).

Prior to *Strengthening*, numerous states had established bodies with the capacity to provide forensic science oversight.¹⁰⁸ There is evidence to suggest that the messages within *Strengthening* have shaped the work of some of these bodies. For example, Texas’s judicial commission that investigates public complaints about forensic science, has embraced *Strengthening*’s findings as being “at the forefront of the national dialogue on efforts to improve forensic science.”¹⁰⁹ It has also spent time discussing challenges and improvements based on the report’s findings.¹¹⁰ In North Carolina, *Strengthening*, coupled with the findings of the North Carolina Innocence Inquiry Commission about forensic science practices,¹¹¹ has influenced the state legislature to reform forensic science services.¹¹² Reforms includes renaming the State Bureau of Investigations to formally separate it from law enforcement, following *Strengthening*’s recommendations,¹¹³ and creating a review board to oversee the work of laboratory employees.¹¹⁴

Judicial Decisions

Judicial responses to *Strengthening* are considered in two categories. First, the Supreme Court’s decision in *Melendez-Diaz*.¹¹⁵ Second, the general approaches of lower courts to *Strengthening*.

Shortly after *Strengthening*’s publication, the United States Supreme Court in *Melendez-Diaz v Massachusetts* relied on the report to acknowledge that “the forensic science system... has serious problems that can only be addressed by a national commitment to overhaul the current structure.”¹¹⁶ In that case, the court clarified that forensic science analysts are witnesses under the Confrontation Clause, and are therefore required to testify in court and be subject to cross-examination.¹¹⁷ Although described as a “straightforward application” of precedent by

¹⁰⁸ For a summary of the New York Commission on Forensic Science, see, Paul C. Giannelli, *Regulating DNA Laboratories: The New Gold Standard?* 69 N.Y.U ANN. SURV. AM. L. 617, 628 (2013-2014).

¹⁰⁹ TEXAS FORENSIC SCIENCE COMMISSION, ANNUAL REPORT FY2011 – JUSTICE THROUGH SCIENCE, 25 (2012) <http://www.txcourts.gov/media/1440349/fsc-annual-report-fy2012.pdf>.

¹¹⁰ TEXAS FORENSIC SCIENCE COMMISSION, SECOND ANNUAL REPORT MAY 2012-NOVEMBER 2013 - JUSTICE THROUGH SCIENCE, 19 (2013) <http://www.txcourts.gov/media/1440350/fsc-annual-report-fy2013.pdf>.

¹¹¹ The North Carolina Innocence Inquiry Commission, *About*, <http://innocencecommission-nc.gov/about/> (last visited April 20, 2019).

¹¹² Kavita Pillai, *Another Competitive Enterprise: A Balanced Private-Public Solution to North Carolina's Forensic Science Program* 90 N. C. L. REV. 253, 257 2011-2012.

¹¹³ HARRY T. EDWARDS, CONSTANTINE GATSONIS ET AL., *supra* note 9, at 23.

¹¹⁴ Kavita Pillai, *supra* note 112, at 258.

¹¹⁵ *Melendez-Diaz v Massachusetts*, *supra* note 97.

¹¹⁶ *Id.* at 319.

¹¹⁷ *Id.*

Justice Scalia,¹¹⁸ the decision has subsequently been cited to reverse proceedings where live witnesses have not appeared.¹¹⁹

A review of lower court case law between 2009 and 2018 shows that *Strengthening* has been cited across over 200 appeal judgments.¹²⁰ Generally, this cohort of cases shows petitioners using *Strengthening* to support a claim that – due to unreliability - particular forensic science evidence is not/should not have been admissible; and that *Strengthening* constitutes ‘newly discovered evidence’ capable of undermining previous outcomes. In responding to these claims, the authors have identified, in particular, five general approaches to *Strengthening*. These approaches are outlined below.

Silence

Some courts have simply ignored the report. There are several judgments where the report has been considered in the dissent, but is absent in the majority decision. For example, the majority judgment in *Commonwealth v Treiber* is silent with regards to *Strengthening*, but the dissenting opinion highlights the need to use *Strengthening* to address limitations of forensic science evidence.¹²¹ The dissenting opinion in *Ex Parte Robbins* also made reference to *Strengthening*, in the absence of its mention in the majority judgment. The report was used to demonstrate the disconnect between science and the law, especially in relation to scientific research being a process of constant evolution, often misunderstood by legal practitioners.¹²²

Strengthening as a Definitional Tool

Courts have used *Strengthening* as a definitional tool. For instance, *Strengthening* has been cited to provide an authoritative explanation of forensic science techniques, including a definition of toolmark identification techniques,¹²³ an explanation of the ACE-V method used to compare fingerprint evidence,¹²⁴ and to explain the roles of the medical examiner¹²⁵ and the autopsy examiner.¹²⁶

Strengthening is Insufficient to Undermine Regular Legal Process

¹¹⁸ *Id.* at 312.

¹¹⁹ *See, e.g.,* *Commonwealth v. Vasquez* 456 Mass. 350 (Mass. 2010); *State v. Ward* 364 N.C. 133 (N.C. 2010).

¹²⁰ The author has undertaken a comprehensive review of cases as part of a wider study examining judicial engagement with the six forensic science NAS reports. Out of 644 cases identified, 218 referred to *Strengthening Forensic Science in the United States: A Path Forward*. This data is on file with the authors.

¹²¹ *See, Commonwealth v. Treiber* 632 Pa. 449 (Pa. 2015).

¹²² *Ex Parte Robbins* 360 S.W.3d 446, 470 (Tex. App. 2011).

¹²³ *See, United States v. Otero* 849 F.Supp.2d 425 (D. N.J. 2012).

¹²⁴ *See, United States v. Herrera* 704 F.3d 480 (7th Cir. 2013) and *People v. Luna* 989 N.E.2d 655 (Ill.App.Ct. 2013).

¹²⁵ *See, State v. Jaramillo* 272 P.3d 682 (N.M. Ct. App. 2011).

¹²⁶ *See, Rosario v. State* 175 So.3d 843 (Fla. Dist. Ct. Appl. 2015).

Some courts have acknowledged the concerns raised in *Strengthening*, but have determined that those concerns do not fatally undermine relevant evidence because that evidence has been subject to regular legal procedures aimed at evaluating the evidence. For instance, courts have found the challenged forensic evidence was properly considered by the trial judge,¹²⁷ lawyers, and/or jury.¹²⁸ In *United States v Herrera*, the appeal court discussed the judicial approach to fingerprint evidence. In concluding that the judge had properly approached the evidence, and the evidence “doesn’t have to be infallible to be probative,” the petitioner’s claim that *Strengthening* undermined fingerprint evidence was dismissed.¹²⁹ In *Commonwealth v Gambora*, for example, the court undertook a lengthy discussion on the questions raised by *Strengthening* about the limitations of fingerprint individualization. They found *Strengthening’s* findings to be “important, and deserv[ing] [of] consideration,”¹³⁰ but ultimately held that defense counsel had – in the process of cross-examination - emphasized the lack of individualization sufficiently.¹³¹ Similarly, in *State v Thomas*, the appellant argued that *Strengthening* undermined the firearm evidence presented during his trial.¹³² The court, however, determined that as there had been no plain error, the report’s findings contributed towards the weight of the evidence, not admissibility.¹³³

Strengthening as Support for Limitations on Expert Testimony

Strengthening has seemingly informed judicial decisions to limit expert firearms testimony.¹³⁴ For instance, in *United States v Ashburn*, the expert’s testimony was curtailed to “a reasonable degree of certainty in the ballistics field,” as opposed to “a “practical impossibility” that any other firearm fired the cartridges in question.”¹³⁵ In making this decision, the court reviewed firearms identification, weighing AFTE practices and guidelines against the findings and recommendations of *Strengthening*. Following a review of *Strengthening*, the judge in

¹²⁷ See, e.g., *United States v. Herrera*, *supra* note 124; *People v. Jones* 2013 WL 5397389 (Cal. Ct. App. Sept. 26, 2013); *People v. Morris* 997 N.E.2d 847 (Ill. App. Ct. 2013).

¹²⁸ See, e.g., *State v. Thomas* 2016 WL 7799279 (Tenn. Ct. App. March 28, 2016); *State v. Romero* 236 Ariz. 451 (Ariz. Ct. App. 2014).

¹²⁹ *United States v. Herrera*, *supra* note 124.

¹³⁰ *Commonwealth v. Gambora* 457 Mass. 715, 727-728 (Mass. 2010).

¹³¹ *Id.*

¹³² *State v. Thomas*, *supra* note 128, at 13.

¹³³ *Id.* at 16.

¹³⁴ A noticeable pattern in judicial decisions limiting the extent of firearms testimony is evident – See, in general, Sarah L. Cooper, Páiraic Scanlon, *Juror Assessment of Certainty about Firearms Identification Evidence*, 40 UALR L. REV. 95 (2017).

¹³⁵ *United States v. Ashburn* 88 F.Supp.3d 239 (E.D.N.Y. 2015); also see *United States v. Taylor* 663 F.Supp.2d 1170 (D.N.M. 2009).

United States v Taylor also limited the expert's firearms testimony, to prevent the expert from concluding that "there is a match to the exclusion... of all other guns."¹³⁶

Strengthening as 'Newly Discovered Evidence'

Courts have routinely dismissed newly discovered evidence petitions that claim *Strengthening* is new evidence. Judges have reasoned that *Strengthening* does not meet the requirements of newly discovered evidence because it is merely a "newly willing source for previously known facts."¹³⁷ In *Ross v Epps*, for example, the court found *Strengthening* did not provide any new evidence contradicting what was said at trial i.e., did not have outcome changing capacity.¹³⁸ This approach has been taken by number of court decisions examining different forensic science techniques.¹³⁹

However, *Strengthening* has seemingly been influential in successful newly discovered evidence claims relating to microscopic hair analysis. In *Commonwealth v Edmiston*,¹⁴⁰ *Strengthening* was used as authority for the notion that there is "no scientific support for the use of microscopic hair analysis."¹⁴¹ This approach was cited in *Commonwealth v Chmiel*, in which *Strengthening* was referred to as the "tipping point" in rejecting hair analysis evidence.¹⁴² Furthermore, in *Commonwealth v Perrot*, the court acknowledged that *Strengthening*, (combined with the FBI's review of relevant hair cases) formed a "new consensus on the limitations and nature of hair analysis [that] constitutes newly available evidence."¹⁴³

FBI Response

Notwithstanding the FBI's review of microscopic hair analysis cases, the FBI has been criticized for its reluctance to modify practice following the publication of *Strengthening*.¹⁴⁴ In particular, the FBI's public objection to *Strengthening*'s finding that the validity of fingerprinting is unknown,¹⁴⁵ has led to questions about the FBI's commitment to forensic science

¹³⁶ *United States v. Taylor, id.* at 1180.

¹³⁷ *Commonwealth v. Riddick* 2017 WL 6568212 (Pa. Super. Ct. 2017 Dec. 26, 2017).

¹³⁸ *Ross v. Epps* 2015 WL 5772196 (N.D.Miss. Sept 30, 2015).

¹³⁹ *See, e.g., Johnston v. State* 27 So.3d 11 (Fla. 2010) (Fingerprints - *Strengthening*); *Foster v. State* 132 So.3d 40 (Fla. 2013) (Ballistics Evidence – *Strengthening*); *Enderle v. State* 847 N.W.2d 235 (Iowa Ct. App 2014) (Fingerprints – *Strengthening*).

¹⁴⁰ This petition was not successful due to being time-barred.

¹⁴¹ *Commonwealth v. Edmiston* 65 A.3d 339, 351 (Pa. 2013).

¹⁴² *Commonwealth v. Chmiel* 173 A.3d 617 (Pa. 2017).

¹⁴³ *See, e.g., Commonwealth v. Perrot* 2016 WL 380123 (Mass. App. Ct. Jan. 26, 2016).

¹⁴⁴ Jonathan J. Koehler, *Forensic Science Reform in the 21st Century: A Major Conference, a Blockbuster Report and Reasons to be Pessimistic*, 9 LAW, PROB. & RISK 1, 4 (2010).

¹⁴⁵ Simon A. Cole, *Who Speaks for Science? A Response to the National Academy of Sciences Report on Forensic Science* 9 LAW, PROB. & RISK 25, 37 (2010).

reform.¹⁴⁶ For instance, Cole has criticized the FBI for both creating barriers to proficiency testing,¹⁴⁷ and “grandfathering” longstanding forensic evidence.¹⁴⁸ This latter practice, it has been suggested, has led to forensic science disciplines with long-term admissibility records being sheltered from scrutiny.¹⁴⁹ Giannelli has criticized the actions of the FBI, arguing that their “shaping the research agenda, limiting access to data, attacking experts..., and “spinning” negative reports” is preventing *Strengthening* from having a meaningful impact.¹⁵⁰

Department of Justice

Strengthening criticized the Department of Justice (DOJ) for neglecting its role in improving forensic science, finding that “the research funding strategies of [the] DOJ have not adequately served the broad needs of the forensic science community.”¹⁵¹ The DOJ has been identified as a stakeholder capable of facilitating meaningful reform,¹⁵² but its desire to make use of this capacity has been questioned. Giannelli, for example, has accused the DOJ of “sabotaging efforts” to conduct research,¹⁵³ and Lander has confronted the DOJ’s resistance to the need for empirical support for evidence.¹⁵⁴ Barkow, however, has reasoned that “conflicts have emerged” between the DOJ’s prosecuting role and the need for further research, and “when they have, prosecution interests have won out.”¹⁵⁵

That said, the DOJ did act when it became clear that a National Institute of Forensic Science would not materialize through an act of Congress.¹⁵⁶ In 2013., the DOJ collaborated with the National Institute of Standards and Technology to create the National Commission on Foren-

¹⁴⁶ See, Jonathan J. Koehler, *supra* note 144, at 4.

¹⁴⁷ Simon A. Cole, *Grandfathering Evidence: Fingerprint Admissibility Rulings from Jennings to Llera Plaza and Back Again*, 41 AM. CRIM. L. REV. 1189 (2004).

¹⁴⁸ *Id.*

¹⁴⁹ See, e.g., Herbert B. Dixon, *Forensic Science Under the Spotlight*, 48 JUDGES J. 36, 37-38 (2009); Mark S. Bridin, *Behavioral Science Evidence in the Age of Daubert: Reflections of a Skeptic*, 73 U. CIN. L. REV. 867, 892-893 (2004).

¹⁵⁰ Paul C. Giannelli, *Daubert and Forensic Science: The Pitfalls of Law Enforcement Control of Scientific Research*, 2011 U. ILL. L. REV. 53, 90 (2011).

¹⁵¹ HARRY T. EDWARDS, CONSTANTINE GATSONIS ET AL., *supra* note 9, at 18.

¹⁵² Paul C. Giannelli, *supra* 150, at 90.

¹⁵³ *Id.*

¹⁵⁴ THE PHILIP D. REED LECTURE SERIES ADVISORY COMMITTEE ON EVIDENCE RULES: *Symposium on Forensic Expert Testimony, Daubert, and Rule 702*, 86 FORDHAM L. REV. 1463, 1521-1522 (2018).

¹⁵⁵ Rachel E. Barkow, *Prosecutorial Administration: Prosecutor Bias and the Department of Justice*, 99 VA. L. REV. 271, 306-307 (2013).

¹⁵⁶ This was despite wide support from academics. See, e.g., Margaret A. Berger, *Evolving Trends in Forensic Science*, 6 TENN. J. L. & POL'Y 147 (2010).

sic Science (NCFS).¹⁵⁷ The NCFS was vested in the DOJ,¹⁵⁸ but designed to fulfil *Strengthening's* oversight recommendations.¹⁵⁹ The creation of the NCFS was welcomed,¹⁶⁰ and between 2013 and 2017 it engaged in a research and reform agenda.¹⁶¹ On the expiration of its four-year charter, however, the NCFS was disbanded.¹⁶² The NCFS reported that further work was necessary to enact reforms.¹⁶³ The NCFS's short tenure revived concerns about the DOJ's commitment to improving forensic science being revisited. Former NCFS member, Professor Jules Epstein, has evaluated the work of the NCFS, noting that political considerations precluded the commission from truly advancing forensic science, calling efforts "evocative of Alice in Wonderland...and not conducive to placing scientific validity first."¹⁶⁴ The need for an oversight body being able to independently navigate its mission is evidently important.

The White House

As part of broader attempts to improve criminal justice, the Obama Administration reviewed *Strengthening* within a 2016 report by the President's Council of Advisors on Science and Technology (PCAST).¹⁶⁵ The PCAST report supported *Strengthening's* findings,¹⁶⁶ but went beyond *Strengthening* by recommending that judges limit the admissibility of particular dis-

¹⁵⁷ NATIONAL COMMISSION ON FORENSIC SCIENCE, REFLECTING BACK – LOOKING TOWARD THE FUTURE, 1 (2017).

¹⁵⁸ NIST, *National Commission on Forensic Science*, <https://www.nist.gov/topics/forensic-science/national-commission-forensic-science> (last visited Dec. 9, 2018).

¹⁵⁹ NATIONAL COMMISSION ON FORENSIC SCIENCE, *supra* note 157, at 3.

¹⁶⁰ Jonathan J. Koehler, John B. Meixner, Jr., *An Empirical Research Agenda for the Forensic Sciences*, 106 J. CRIM. L. & CRIMINOLOGY 1, 8 (2016).

¹⁶¹ During its four-year tenure, the NCFS adopted 43 work products, requiring action from the Attorney General, 20 recommendation documents and 23 views documents. These have either explored foundational documents designed to strengthen the reliability and validity of forensic science evidence, operational work products, and relational work products.

¹⁶² The United States Department of Justice Archives, *National Commission on Forensic Science*, <https://www.justice.gov/archives/ncfs> (last visited Dec. 9, 2018).

¹⁶³ NATIONAL COMMISSION ON FORENSIC SCIENCE, *supra* note 157.

¹⁶⁴ Jules Epstein, *The National Commission on Forensic Science: Impactful or Ineffectual?*, 48 SETON HALL L. REV. 743, 771 (2018).

¹⁶⁵ EXECUTIVE OFFICE OF THE PRESIDENT, PRESIDENT'S COUNCIL OF ADVISORS ON SCIENCE AND TECHNOLOGY, FORENSIC SCIENCE IN CRIMINAL COURTS: ENSURING SCIENTIFIC VALIDITY OF FEATURE COMPARISON METHODS (2016).

¹⁶⁶ See, e.g., Geoffrey Stewart Morrison and William C. Thompson, *Assessing the Admissibility of a New Generation of Forensic Voice Comparison Testimony*, 18 COLUM. SCI. & TECH. L. REV. 326, 334 (2017); Eric S. Lander, *The Philip D. Reed Lecture Series Advisory Committee on Evidence Rules: Fixing Rule 702: The PCAST Report and Steps to Ensure the Reliability of Forensic Feature-Comparison Methods in the Criminal Courts*, 86 FORDHAM L. REV. 1661 (2018).

ciplines.¹⁶⁷ Despite this, the report’s findings were dismissed by the FBI¹⁶⁸ and the DOJ,¹⁶⁹ and rejected completely by the AFTE (Association of Firearm and Tool Mark Examiners), who described the report as “lack[ing] in adequate investigation and understanding.”¹⁷⁰ The PCAST report has been referenced alongside *Strengthening* by some courts. For example, in *United States v Bonds*, both reports were referenced to argue that fingerprint evidence is not sufficiently reliable to be admitted into evidence.¹⁷¹ While the court acknowledged PCAST’s findings, the court determined that these concerns should go to the weight of evidence, not admissibility.¹⁷² This decision has since been followed by subsequent courts, who have used *Bonds* to determine that “the PCAST report presents only advisory recommendations concerning validity,” and that the issue remains one of weight, and therefore a matter for the jury to determine.¹⁷³

PART II: A TEMPLATE FOR FUTURE REPORTING

The various stakeholder responses to both the *CBLA Report* and *Strengthening* are informative. They provide guidance on what messages stakeholders have received or acted on from the two NAS reports, but also what issues seemingly limit stakeholders in responding comprehensively to concerns raised by the reports. Based on the experiences of the *CBLA Report* and *Strengthening*, Part II presents a template i.e., ideas for the NAS to consider when reporting on forensic science. This template is suggested with a view to both enhancing the NAS’ impact when reporting, and enabling stakeholders to better harness the expertise of the NAS. The template has two parts. The first part – outlined in sub-section (a) - encourages the NAS to build on existing stakeholder engagement. The second part – outlined in sub-section (b) - encourages the NAS to be more expressly sensitive to the frameworks/cultures within which stakeholders operate.

a. Building on Existing Stakeholder Engagement

¹⁶⁷EXECUTIVE OFFICE OF THE PRESIDENT, *supra* note 165, at 142-145.

¹⁶⁸ FBI, *Comments on: President’s Council of Advisors on Science and Technology REPORT TO THE PRESIDENT Forensic Science in the Criminal Courts: Ensuring Scientific Validity of Pattern Comparison Methods*, Sept. 20, 2016 <https://pceinc.org/wp-content/uploads/2016/10/20160920-Response-to-PCAST-Report-FBI-.pdf>.

¹⁶⁹ Gary Fields, *White House Advisory Council Report is Critical of Forensics Used in Criminal Trials*, WALL STREET JOURNAL, Sept. 20, 2016.

¹⁷⁰ Association of Firearm and Tool Mark Examiners, *Response to PCAST Report on Forensic Science*, Oct. 31, 2016 https://afte.org/uploads/documents/AFTE_PCAST_Response.pdf.

¹⁷¹ *United States v. Bonds* 2017 WL 4511061 (N. D. Ill. 2017).

¹⁷² *Id.*

¹⁷³ *United States v. Pitts* 2018 WL 1116550 (E.D.N.Y. 2018).

Part I outlined how the selected NAS reports have attracted stakeholder engagement. This is true beyond these two specific reports.¹⁷⁴ Reflecting on where the NAS reports have already received traction, this subsection suggests four areas where the NAS could target its activity.

The NAS Reports as Referencing Tools

Case law consistently demonstrates that the NAS' reports on forensic science are used by judges as a reference tool. As explored in Part I, this is true of *Strengthening*.¹⁷⁵ The *CBLA Report* has also been used by judges as a referencing tool, such as in *United States v Berry*, where the *CBLA Report* was used to consider how CBLA matches are declared, and an excerpt from the report was quote to provide information about variations in reliability of CBLA, as manufacturing processes are not taken into account during analysis.¹⁷⁶ This is also the case beyond these two reports. For example, judges have used *DNA Technology in Forensic Science* (1992) and *The Evaluation of Forensic DNA Evidence* (1996) as an authoritative definition of how DNA evidence is extracted and analyzed.¹⁷⁷ These two reports have also been referenced for their explanations of statistical calculations as to the significance of a DNA match.¹⁷⁸

This reliance on the authority of NAS reports to provide information about forensic science techniques suggests that courts see the NAS as a scientific authority, independent of parties to the trial process. To this end, the authors suggest that the NAS could maximize the impact of its reporting in this way. One suggestion for doing this is for the NAS to create a living document (reflecting that this information may change in line with the nature of scientific inquiry) on forensic science techniques. Such a document could include a definition of all examined forensic science techniques, information about methods of identification and analysis, and a summary of limitations. Through the NAS collating existing forensic science definitions, legal actors benefit from a single-source material, which will provide an independent and authoritative definition of forensic science techniques.

Targeting Trending Issues

Part I highlights that the selected reports have played a role in shaping conversations around trending issues in forensic science. For example, albeit resisted at first by the FBI, the *CBLA Report* ultimately kick-started changes in FBI practices, with the FBI recognizing action was

¹⁷⁴ There exists much legal academic literature discussing stakeholders' engagement with the six forensic science NAS reports. The authors undertook a review of each, and found 278 references for *DNA Technology in Forensic Science* (1992), 206 for *The Evaluation of Forensic DNA Evidence* (1996), 82 for *The Polygraph and Lie Detection* (2003), 68 for *Forensic Analysis: Weighing Bullet Lead Evidence* (2004), 34 for *Ballistic Imaging* (2008), and 391 for *Strengthening Forensic Science in the United States: A Path Forward* (2009).

¹⁷⁵ See Part I, Judicial Decisions, *Strengthening as a Definitional Tool*.

¹⁷⁶ *United States v. Berry* 624 F.3d 1031, 1040 (9th Cir. 2010).

¹⁷⁷ See, e.g., *Harmon v. State* 908 P.2d 434 (Alaska Ct. App. 1995); *People v. Soto* 21 Cal.4th 512 (Cal. 1999).

¹⁷⁸ See, e.g., *People v. Reeves* 91 Cal.App.4th 14 (Cal. Ct. App. 2001); *People v. Pike* 53 N.E.3d 147 (Ill. App. Ct. 2016).

needed.¹⁷⁹ Further, *Strengthening* has evidently informed legal claims surrounding the reliability of several forensic disciplines.¹⁸⁰ Noting this, it is suggested that the NAS continues to proactively identify issues in forensic science that are receiving increased stakeholder scrutiny. For example, the NAS could target reporting on what steps might follow the FBI's collaborative review of microscopic hair analysis,¹⁸¹ and/or further investigate trends in judicial decision-making as they relate to contentious forensic science evidence. In relation to the latter, for instance, there is a notable pattern in judicial decision-making with regards to the phraseology of expert testimony provided by firearm examiners.¹⁸² The authors suggest that the NAS could target reporting on these trending issues, in order to maximize their impact and assist stakeholders as they attempt to address uncertainties.

This proactive approach would be in line with the NAS' history of taking initiative to explore pressing issues, which contribute to enabling stakeholders to resolve uncertainty. This includes issues relating to criminal justice. For instance, the 1992 report - *DNA Technology in Forensic Science* – was born from a series of conversations between the FBI and the National Research Council in 1988.¹⁸³ In the light that the FBI could not provide sufficient funds to investigate the DNA-related issues, the NAS reached out to private and state bodies for funds. The NAS was successful in obtaining \$310,000,¹⁸⁴ and initiated the study in January 1990.¹⁸⁵

State Level Engagement

Although the CBLA and *Strengthening* reports were commissioned by federal entities, their outcomes have been harnessed by state-based institutions to bring about change at state level. As discussed in Part I, *Strengthening* has been used by the Texan legislature to underpin broader criminal justice reforms, and also in North Carolina. State courts have also harnessed NAS reports to inform their decision making. Several state courts have used the *CBLA Report* to support decisions to overturn convictions, including the Court of Appeals of Maryland in *Clemons v State*,¹⁸⁶ and the Superior Court of New Jersey in *State v Behn*.¹⁸⁷ Again, this state-

¹⁷⁹ See, FBI National Press Office, *supra* note 33. Following the publication of the *CBLA Report*, the FBI conducted an internal review of CBLA practices and subsequently decided to discontinue CBLA.

¹⁸⁰ A search for cases published between 2009 and 2018 that directly reference *Strengthening* was undertaken. This produced 218 results. These materials are on file with the authors.

¹⁸¹ The FBI last reported on the progress of its review of microscopic hair analysis in 2016. For more information, See, FBI Services, *FBI/DOJ Microscopic Hair Comparison Analysis Review*, <https://www.fbi.gov/services/laboratory/scientific-analysis/fbidoj-microscopic-hair-comparison-analysis-review> (last visited Feb. 28, 2019).

¹⁸² See, *in general*, Sarah L. Cooper, Páraic Scanlon, *supra* note 134.

¹⁸³ See, archival material pertaining to DNA Technology in Forensic Science – materials are on file with the authors.

¹⁸⁴ *Id.*

¹⁸⁵ VICTOR A. MCKUSICK, *supra* note 3, at vii.

¹⁸⁶ *Clemons v. State* 329 Md. 339 (Md. 2006).

¹⁸⁷ *State v. Behn* 375 N.J.Super. 409 (N.J. Super. Ct. App. Div. 2005).

level impact is evident beyond these two reports. For instance, judges in California have used *DNA Technology in Forensic Science* and *The Evaluation of Forensic DNA Evidence* to inform their evolving approach to DNA evidence in criminal cases.¹⁸⁸

This state-level traction suggests that federally commissioned and directed NAS reports can have a significant impact at state level. States can be considered more receptive and/or able to deliver reform. Reflecting on this, and the fact that the NAS' mandate does not expressly preclude them from receiving requests about and/or focusing on state-specific issues, the authors suggest the NAS could develop a state-specific portfolio, targeting issues of specific concern to individual states or groups of states.

Taking Forward National Efforts

Albeit challenging, there have been national efforts to address concerns about forensic science. The National Commission for Forensic Science (NCFS), and the 2016 President's Council of Advisors on Science and Technology (PCAST) report emerged from observations set out in *Strengthening*. As explored in Part I, the NCFS was disbanded in 2017, and the 2016 PCAST report has had a critical response and somewhat nuanced impact.¹⁸⁹ Some have considered this disappointing. For example, Judge Konzinski expressed his dissatisfaction following the PCAST report, showing disappointment at the "swiftness with which the U.S. Justice Department and FBI rejected the report on... insubstantial grounds."¹⁹⁰ Similarly, Professor Epstein's response to the dissolution of the NCFS demonstrates frustration at the limited impact of the body.¹⁹¹ However, the authors suggest that the NAS – as an independent body - could be the appropriate body to re-energize these efforts, building on the foundations laid by the NCFS and PCAST, and using its expertise in bringing together multi-stakeholders to advance existing ideas.¹⁹²

b) Sensitivity to the Frameworks within which Stakeholders Operate

A key element to building on existing stakeholders engagement effectively would be to do so in a way that is expressly sensitive to the frameworks that stakeholders operate within. A variety of stakeholders – ranging from the FBI and DOJ, to the courts and Congress – have en-

¹⁸⁸ In California, the 1992 case of *People v. Barney* (8 Cal.App.4th 798 (Cal. Ct. App. 1992)) became the leading case for determining the admissibility of DNA evidence using the ceiling principle under the *Kelly* admissibility standard, with subsequent cases using *Barney* as a starting point whilst incorporating technological developments. For example, *People v. Venegas* (18 Cal.4th 47 (Cal. 1998)) confirmed the admissibility of the product rule of statistical calculations following the publication of *The Evaluation of Forensic DNA Evidence* (1996) and *People v. Reeves* (91 Cal.App.4th 14 (Cal. Ct. App. 2001)) further developed DNA case law by holding that the product rule can be used when the DNA is analyzed using the PCR method.

¹⁸⁹ Association of Firearm and Tool Mark Examiners, *supra* note 170.

¹⁹⁰ The Philip D. Reed Lecture Series Advisory Committee on Evidence Rules, *Symposium on Forensic Expert Testimony, Daubert, and Rule 702*, 86 FORDHAM L. REV. 1463, 1492 (2018).

¹⁹¹ See, Jules Epstein, *The National Commission on Forensic Science: Impactful or Ineffectual?*, 48 SETON HALL L. REV. 743 (2018).

¹⁹² The NAS has already used its position to bring together stakeholders in workshops to discuss specific issues. See, e.g., FREDERICK L. OSWALD, PERSONNEL SELECTION IN THE PATTERN EVIDENCE DOMAIN OF FORENSIC SCIENCE: PROCEEDINGS OF A WORKSHOP (2017).

gaged with the *CBLA Report* and *Strengthening*. In preparing and publishing its reports, the NAS demonstrates an appreciation for its audiences and an awareness of consequences for stakeholders beyond their commissioning bodies. The same can be said for in relation to NAS' other forensic science reports.¹⁹³ Part I demonstrates, however, that each stakeholder can be limited in their response by their own institutional frameworks and culture.

This point can be teased out across various examples, with individual stakeholders demonstrating particular concerns. Congress and the FBI are expressly cognizant of resource implications. Congressional committees have addressed funding and resource issues several times. For example, the House of Representatives Committee on Science and Technology has expressed concern about a congressional focus on funding around DNA evidence to the detriment of non-DNA evidence.¹⁹⁴ The FBI justified its discontinuation of CBLA by considering “the costs of maintaining the equipment [and] the resources necessary to do the examination”¹⁹⁵ Further, the FBI and DOJ are clearly placed in a difficult position when presented with reporting that undermines their institutional practices, particularly those that have been in use for a long time. Moreover, they both demonstrate a preference for remedying problems from the inside out. For example, following the publication of the *CBLA Report*, the FBI initiated an internal examination of the technique before discontinuing the practice in September 2005. Moreover, by creating the National Commission on Forensic Science within the DOJ, the DOJ was able to first look internally at its practices. Judicial decision-making, on the other hand, is naturally informed by the legal process vision i.e., guided by such concerns as the need finality, and to make decisions that give deference to institutional competences, such as the designated roles of judges, lawyers, and jurors. This is evidenced in decisions including *Commonwealth v Joyner*,¹⁹⁶ *Commonwealth v Fisher*,¹⁹⁷ and *State v Romero*.¹⁹⁸ The courts and its actors can also be hindered in interpreting science reports due to a lack of in-house scientific expertise.¹⁹⁹ Moreover, all stakeholders are vulnerable to the political climate of the day.

¹⁹³ *DNA Technology in Forensic Science, The Evaluation of Forensic DNA Evidence*, and *Ballistic Imaging* have each received considerable citations in case law. Over the period 1992-2017, the authors have identified 213, 183, and 32 citations respectively.

¹⁹⁴ Committee on Science and Technology House of Representatives, *supra* note 96, at 9.

¹⁹⁵ See, FBI National Press Office, *supra* note 43.

¹⁹⁶ The petitioner in *Commonwealth v. Joyner* 467 Mass. 176 (Mass. 2014) argued that the statistical significance of fingerprint evidence should be presented alongside a match, using *Strengthening* as evidence that fingerprint matches are often overstated. The Supreme Judicial Court of Massachusetts rejected this, as precedent demonstrates the long-standing admissibility of latent print evidence, leaving the weight of the evidence to be determined by the fact-finder.

¹⁹⁷ In *Commonwealth v. Fisher* 582 Pa. 276 (Pa. 2005), The Supreme Court of Pennsylvania held that the *CBLA Report* did not constitute new evidence, dismissing the petitioner's claim. They relied on two finality considerations for this: lack of evidence, and untimeliness of the petitioner's claim.

¹⁹⁸ The Arizona Court of Appeals in *State v. Romero* 236 Ariz. 451 (Ariz. Ct. App. 2014) dismissed the petitioner's claim using *Strengthening* that firearm evidence was not admissible under Rule 702 on the basis that the limitations of the evidence had been cross-examined and assessed by the jury at trial.

¹⁹⁹ See, e.g., Edward Imwinkelried, *Coming to Grips with Scientific Research in Daubert's Brave New World: The Courts' Need to Appreciate the Evidentiary Differences between Validity and Proficiency Studies*, 61 BROOK L. REV. 1247 (1995).

These observations are not surprising. They reflect the very nature of the functions that these stakeholders perform. Common to them all, however, is a concern about maintaining public confidence in the criminal justice system, as each of them play a role in that maintenance. The NAS reports - through reflecting progression in scientific thought and/or a new presentation of existing knowledge, naturally have the potential to destabilize public confidence. Indeed, stakeholders have expressly recognized this.²⁰⁰

With this in mind, the authors' final suggestion is that the NAS – building on its current practices - more expressly shapes its reporting to account for the concerns of its primary audiences.²⁰¹ This is not a call for the NAS to change the substance of the messages it reports, but rather a suggestion that it takes action to acknowledge more expressly the concerns of its audience(s). For example, the NAS could, within its reports:

- a. set out resources/costings options;
- b. generate bite-sized steps to reform that can have a phased implementation (including short, medium, and long-term plans);
- c. set out actions that stakeholders can take internally to further investigate or remedy deficiencies and initiate reforms reported on;
- d. set out actions that stakeholders can undertake collectively or collaboratively; and
- e. provide express points of reference for stakeholders (e.g. suggestions for findings of judicial notice; novel findings; and/or points in time at which scientific consensus could be deemed to exist).

As part of this, the NAS can take a lead role in (1) facilitating cross-stakeholder collaboration; and (2) normalizing and explaining the nature of the scientific method, progress, findings, and uncertainty.

The latter practice is, in particular, crucial. This is because many stakeholders are understandably nervous about taking actions that would undermine public confidence in the criminal justice system's actors, processes, and institutions (by, for example, declaring a long-time used forensic science identification method to be unreliable or, from a court's perspective, inadmissible). Law shapes the criminal justice system, and law is known for being sceptical about change, preferring to take approaches that achieve finality, predictability and pro-

²⁰⁰ See, e.g., Jennifer E. Laurin, *Criminal Law's Science Lag: How Criminal Justice Meets Changed Scientific Understanding*, 93 TEX. L. REV. 1751 (2015), which provides examples of stakeholders' responses to several events having the potential to undermine public confidence in forensic science relied upon by these bodies. It assesses stakeholders' responses in reducing the uncertainty caused, and their efforts to maintain public confidence in the criminal justice system's reliance on forensic science evidence.

²⁰¹ It is evident that the NAS does take into account the context within which its reports are situated. One such example is in *Strengthening* where the report discussed issues with the *Daubert* framework. (HARRY T. EDWARDS, CONSTANTINE GATSONIS ET AL., *supra* note 9, at 110). The authors suggest that these links should be made stronger.

cedural regularity.²⁰² By contrast, science generally “embraces change.”²⁰³ The products of the scientific method are widely understood to be provisional: hypotheses are routinely revised or abandoned and replaced by new dominant theories. This methodology “motivates more and more scientific study, and is thus vital to the scientific enterprise.”²⁰⁴ The NAS’ forensic science reports embody this culture of science, reflecting a culture of collaboration and inquiry.²⁰⁵ As such, the NAS – through its reporting - can (continue to) play an important role in educating stakeholders and the wider public about the scientific method, including the normalcy of provisional findings and uncertainty. This is aligned with the NAS’ role to provide independent, unbiased, and scientifically robust evidence that can inform sound public policy,²⁰⁶ and its mission to “encourage education and research... [and] increase public understanding in matters of science....”²⁰⁷

CONCLUSION

The National Academy of Sciences is the United States’ leading science and technology think-tank, with an active commitment to “provide scientific advice to the government whenever called upon.”²⁰⁸ It has a mission to provide “independent, objective advice to the nation on matters related to science and technology”, and to “encourage education and research... increase public understanding in matters of science....”²⁰⁹

Over the last 150 years, the NAS has generated a diverse and important portfolio of research, including six reports commenting on the status of forensic science evidence in the USA, namely *DNA Technology in Forensic Science* (1992), *The Evaluation of Forensic DNA Evidence* (1996), *The Polygraph and Lie Detection* (2003), *Forensic Analysis: Weighing Bullet Lead Evidence* (2004), *Ballistic Imaging* (2008), and *Strengthening Forensic Science in the United States: A Path Forward* (2009). These reports were fueled by growing concerns about particular forensic science disciplines (and specifically their application in legal proceedings). The response of stakeholders – including the FBI, Department of Justice, Congress, the judiciary, state legislatures, and the White House- to these reports has varied. Using the different experiences of two reports - *Forensic Analysis: Weighing Bullet Lead Evidence* (2004) and *Strengthening Forensic Science in the United States: A Path Forward* (2009) - as a vehicle,

²⁰² Sarah Lucy Cooper, *Forensic Science Identification Evidence: Tensions Between Law and Science*, 16 J. PHIL. SCI. & L. 1, 4 (2016).

²⁰³ *Id.*

²⁰⁴ Deborah M. Hussey Freeland, *Speaking Science to Law*, 25 GEO. INT’L ENVTL. L. REV. 289, 303 (2013).

²⁰⁵ For example, shortly following the publication of the NAS’s first DNA report, *DNA Technology in Forensic Science* (1992), the NAS, in recognition of “a period of rapid progress,” revisited several issues concerning DNA evidence in their follow-up report *The Evaluation of Forensic DNA Evidence* (1996). JAMES F. CROW ET AL., *supra* note 2, at vi.

²⁰⁶ National Academy of Sciences, *Code of Conduct*, <http://www.nasonline.org/about-nas/code-of-conduct.html> (last visited Apr. 23, 2019).

²⁰⁷ National Academy of Sciences, *supra* note 10.

²⁰⁸ *Id.*

²⁰⁹ *Id.*

this article has suggested a template for how the NAS can strengthen the impact of its forensic science reporting, which will enable stakeholders to better harness the unique expertise of the NAS.

This two-part template first encourages the NAS to build on existing stakeholder engagement with its forensic science reporting. This includes developing referencing tools; targeting trending issues; engaging directly with states; and progressing existing national efforts. Second, the template encourages the NAS to be more expressly sensitive to the frameworks/cultures within which stakeholders operate. This may include reports setting out resources/costs options; bite-sized and phased reform plans; ideas for internal actions and external collaborations; and providing express points of reference. These suggestions will enable to the NAS to take a lead role in (1) facilitating cross-stakeholder collaboration; and (2) normalizing and explaining the nature of the scientific method, progress, findings, and uncertainty, so as to support stakeholders to maintain public confidence in the criminal justice system. This role aligns neatly with the NAS' unique history, function, and mission.