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Science without Precedent: The Impact of the National Research Council Report on the Admissibility and Use of Forensic Science Evidence in the United States

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SCIENCE WITHOUT PRECEDENT: THE IMPACT OF THE  
NATIONAL RESEARCH COUNCIL REPORT ON THE  
ADMISSIBILITY AND USE OF FORENSIC SCIENCE EVIDENCE  
IN THE UNITED STATES

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ABSTRACT

*This article treats the 2009 publication of a report on forensic science by the United States National Research Council (NRC or NAS report) as a watershed that illuminates the recent controversy around the forensic sciences. The NRC Report enabled a heterogeneous set of voices with a variety of perspectives and credentials, to momentarily speak univocally “for science”, through an authoritative national institution. The NRC produced a report that was surprisingly critical of both the forensic sciences and the performance of legal institutions. We might expect this temporary univocality and the directed criticism to pose challenges for law, particularly any attempt to dismiss or counter the epistemic authority of scientists and “science.” This article explores this issue by reviewing legal decisions on forensic science evidence published after the NRC report. We found that courts gave relatively little weight to “science” even when available as an official report from an authoritative institution. The article then reviews several rhetorical devices used by courts to justify their limited engagement with the NRC Report. The article concludes with some reflections on what this episode may reveal about the relationship between science and law more generally.*

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## 1. INTRODUCTION: CHALLENGING FORENSIC SCIENCE EVIDENCE

Science and law are social institutions enjoying great epistemic legitimacy and authority in contemporary post-industrial societies.<sup>3</sup> Not surprisingly, they are, on occasion, seen as competing for epistemic legitimacy. One area in which this competition has seemed particularly acute is in controversies around the use of forensic science evidence in criminal law that forms the subject of this special issue.<sup>4</sup> To summarize: self-appointed advocates of “science” have claimed that criminal courts in the United States have been unreasonably permissive in the reception of forensic science evidence, failing to hold it to the standards of genuine science.<sup>5</sup>

For at least two decades such arguments have been mounted by scientists and scholars; asserting an authority to speak on behalf of science.<sup>6</sup> Such assertions can, of course, be contested. Resistance by individual forensic practitioners and the institutionalized forensic sciences generally found favor with trial judges and appellate courts.<sup>7</sup> In 2009, however, the National Research Council (NRC), the research arm of the United States National Academies, published a substantial report on the forensic sciences, entitled *Strengthening Forensic Science in the United States* [hereafter *Strengthening*].<sup>8</sup> This report has generally been interpreted as quite critical of forensic science evidence. Alternative readings are among the topics we explore, though we accept that *Strengthening* is indeed critical and perhaps intentionally controversial. We note that the press release ac-

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<sup>3</sup> This epistemic legitimacy, or authority, is not experienced consistently and has to be negotiated and in some ways ‘earned’.

<sup>4</sup> An earlier, and perhaps more conspicuous controversy focused on the role of expert evidence (and so-called ‘junk science’) in civil proceedings in the United States. Another example involves disputes over creation science and intelligent design under the First Amendment.

<sup>5</sup> Many of these issues pertain to other countries as well, but the United States is widely seen as a site where controversy has been particularly open. The literature on this controversy has been voluminous; see generally works by Michael Saks, Jonathan Koehler, William Thompson, Peter Neufeld, Barry Scheck, David Faigman, D. Michael Risinger, Margaret Berger, Erica Beecher-Monas, Paul Giannelli, and David Kaye.

<sup>6</sup> Rather than advocates for science, some commentators have been concerned that legal standards have been interpreted in ways that are inconsistent with overarching legal principle, thereby admitting too much insufficiently reliable incriminating expert opinion evidence. See, e.g., Gary Edmond & Andrew Roberts, *Procedural Fairness, the Criminal Trial and Forensic Science and Medicine*, 33 SYDNEY L. REV. 359 (2011).

<sup>7</sup> We use the terms “forensic practitioner”, “forensic analyst” and “forensic scientist” interchangeably, although many forensic scientists do not possess scientific qualifications from a university.

<sup>8</sup> COMMISSION ON IDENTIFYING THE NEEDS OF THE FORENSIC SCIENCE COMMON, NATIONAL RESEARCH COUNCIL OF THE NATIONAL ACADEMY OF SCIENCE, *STRENGTHENING FORENSIC SCIENCE IN THE UNITED STATES: A PATH FORWARD* (2009) [hereinafter NRC report]. The report is also referred to as the NAS report (after the National Academy of Sciences) and just ‘the report’.

companying the publication of the report was titled “‘Badly Fragmented’ Forensic Science System Needs Overhaul: Evidence to Support Reliability of Many Techniques Is Lacking.”<sup>9</sup>

*Strengthening* changed the nature of the controversy because it could reasonably be represented as a quasi-official utterance of the American scientific establishment in a way that complemented, or perhaps eclipsed, the conclusions of both individual scientists and self-organized collectives who had been raising their own concerns. The NRC convenes between 200 and 300 expert committees each year to produce “consensus studies” that are published as Reports. Because of the National Academies’ reputation, NRC reports command a special authority on scientific and technical matters. As one scholar has observed, “[n]o other U.S. institution has the same mix of characteristics: unquestionable scientific and technological expertise; an official congressional charter to provide scientific advice to the federal government; and independence from the political chain of command. NRC reports draw a great deal of credibility from these aspects of the Academy’s identity.”<sup>10</sup> Indeed, the National Academies have often been called a “court of last resort” on scientific controversies.<sup>11</sup>

Historically, American courts “have treated the reports of the NRC as authoritative works for purposes of determining generally accepted standards within the scientific community.”<sup>12</sup> *Strengthening*, therefore, provides an opportunity to explore whether American courts are, as many have suggested, unusually resistant to criticism or, in the alternative, protective of forensic science evidence. If they are not particularly protective we might expect the shift from individual and group criticism to quasi-official criticism by the NRC to have an effect on the response to forensic science evidence by trial and appellate courts, especially in those jurisdictions with formal reliability standards governing the admission of expert opinion.<sup>13</sup> If, on the other hand, there is no such effect, then the apparent insensitivity to authoritative expressions of concerns about the condition of the modern forensics warrants attention. This issue may be of interest not only to those concerned with controversies in criminal law and the forensic sciences, but also to those interested more generally in the struggle for epistemic authority between law and science.

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<sup>9</sup> ‘Badly Fragmented’ Forensic Science System Needs Overhaul; Evidence to Support Reliability of Many Techniques is Lacking, NATIONAL ACADEMIES (Feb. 18, 2009), <http://www8.nationalacademies.org/onpinews/newsitem.aspx?RecordID=12589>.

<sup>10</sup> STEPHEN HILGARTNER, SCIENCE ON STAGE 45 (2000).

<sup>11</sup> Zoë Corbyn, *NAS: Speaking the Truth to Power for 150 Years*, 381 THE LANCET 713, 713 (2013).

<sup>12</sup> *Com. v. Gaynor*, 820 N.E.2d 233, 250 (Mass. 2005). See, e.g., *People v. Reeves*, 109 Cal. Rptr. 2d 728, 749 (Cal. Ct. App. 2001) (“[C]ourts have recognized that ‘the [NRC] is a distinguished cross section of the scientific community.... Thus, that committee’s conclusion... can easily be equated with general acceptance of those methodologies in the relevant scientific community.’”) (quoting *People v. Venegas*, 954 P.2d 525, 552 (1998)). We are relying here on research performed by Professor Nina Chernoff and the Public Defender Service of the District of Columbia, and are grateful for their contribution.

<sup>13</sup> Following the decisions in *Daubert v. Merrell Dow Pharm., Inc.*, 509 U.S. 579 (1993) and *Kumho Tire Co. v. Carmichael*, 526 U.S. 137 (1999).

Recent research illuminates this issue. Cooper studied post-*Strengthening* judgments across four disciplines, namely fingerprints, firearm and toolmarks, bite marks, and arson investigation.<sup>14</sup> Although she does not specify the number of cases analyzed, her data set clearly overlaps with our own. Cooper found that, while the courts were more critical of these forms of evidence post-*Strengthening*, “[t]o date, the NAS Report has not led any court to conclude that evidence from any of these four disciplines is inadmissible.”<sup>15</sup> This finding supports the contention that courts are protective, perhaps exceptionally protective, of forensic science evidence adduced by prosecutors. However, Cooper identified multiple rulings limiting in some way the testimony that forensic experts could proffer, a phenomenon we have discussed under the label “split testimony.”<sup>16</sup> She also found that “untraditional evidence” was excluded, such as “simultaneous impressions” in latent print identification.<sup>17</sup> In supporting these rulings the courts, according to Cooper, relied heavily on precedent and varied widely in their degree of engagement with the NRC report.<sup>18</sup>

Epstein analyzed 65 post-*Strengthening* judicial decisions.<sup>19</sup> He found that “courts have overwhelmingly declined to revisit admissibility determinations or circumscribe the proposed testimony in pattern and impression evidence cases.”<sup>20</sup> Epstein notes that “[o]verall the Report has had virtually no impact on trial court acceptance of latent print evidence,”<sup>21</sup> and “[t]o date, no reported decision has relied on the NAS Report to restrict a handwriting analyst’s conclusion.”<sup>22</sup> He concluded that “[t]o date, only two prominent examples responding to the NAS Report can be identified.”<sup>23</sup> Both instances (one is not even a case) concern firearm and toolmark analysis, leading Epstein to conclude that this is the only discipline for which *Strengthening* might seem to have changed the courts’ stance toward forensic science evidence.<sup>24</sup> Though, “[e]ven in regard to that discipline,”

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<sup>14</sup> Sarah Lucy Cooper, *The Collision of Law and Science: American Court Responses to Developments in Forensic Science* 33 PACE L. REV. 234 (2013).

<sup>15</sup> *Id.* at 301.

<sup>16</sup> Simon A. Cole, *Splitting Hairs? Evaluating ‘Split Testimony’ as an Approach to the Problem of Forensic Expert Evidence*, 33 SYDNEY L. REV. 459. See also, Betty Layne DesPortes, *Friction Ridge Opinion Evidence after Daubert and the NAS Report*, in WILEY ENCYCLOPEDIA OF FORENSIC SCIENCE (Allan Jamieson & Andre A. Moenssens eds., 2014).

<sup>17</sup> Cooper, *supra* note 14, at 301, discussing *Commonwealth v. Patterson*, 840 N.E.2d 12 (Mass. 2005).

<sup>18</sup> *Id.* at 300.

<sup>19</sup> Jules Epstein, *Preferring the “Wise Man” to Science: The Failure of Courts and Non-Litigation Mechanisms to Demand Validity in Forensic Matching Testimony*, 20 WIDENER L. REV. 81, 101 (2014). See also, Gabriel A. Fuentes, *Toward a More Critical Application of Daubert in Criminal Cases: Fingerprint Opinion Testimony After the National Academy of Sciences Report*, 12 EXPER. EV. REP 549, 10/22/12.

<sup>20</sup> *Id.*

<sup>21</sup> *Id.* at 103.

<sup>22</sup> *Id.* at 104.

<sup>23</sup> *Id.* at 106.

<sup>24</sup> Nancy Gertner, *Commentary on the Need for a Research Culture in the Forensic Sciences* 58 UCLA L. REV. 789, 792 (2011). The other instance is *Commonwealth v. Pytou Heang*, 942 N.E.2d 927 (2011).

Epstein notes, “the remediation by the courts is modest at best.”<sup>25</sup> Epstein attributes this state of affairs to the weakness of the *Frye* and *Daubert* admissibility standards, the lack of scientific literacy among courtroom actors, and “a stasis or inertia resulting from decades or more of reliance on these disciplines and their perceived continued utility.”<sup>26</sup>

Given these findings, we were interested in investigating the apparent reluctance to accept the *science advice* of the NAS.<sup>27</sup> Our interest is rooted in our common background in Science & Technology Studies (STS) and expert evidence in legal proceedings. Studies of legal controversies rooted in STS have drawn attention to the substantial flexibility that legal actors, including judges, have with regard to choosing whether or not to treat scientific accounts as authoritative.<sup>28</sup> This essay reviews responses to *Strengthening*, particularly whether judicial discretion and interpretive flexibility is diminished when the account is a deliberately constructed consensus document produced under the imprimatur of an institution with great authority within mainstream science.<sup>29</sup> Exploring judicial rationales for accepting, not accepting, and even an apparent refusal to engage with, *Strengthening’s* critique may advance our understanding of the circumstances in which “science” and scientific institutions can hope to influence legal practice.

#### A. MATERIALS AND METHODS

##### i. The NRC Report: *Strengthening the Forensic Sciences in the United States* (2009)

Obviously, *Strengthening* is a key material in our study. The report reviews forensic science domains, including: biology, controlled substances, friction ridge analysis, shoeprints and tire tracks, toolmark and firearms, hair and fibres, documents, paints and coatings, explosives and fire debris, odontology, bloodstains, digital and multimedia. Summarizing the findings of the 350-page report is challenging and risks counter-claims of misrepresentation.<sup>30</sup> For our purposes, we highlight a single sentence:

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<sup>25</sup> Epstein, *supra* note 19, at 83.

<sup>26</sup> *Id.* at 84. See also *United States v. Frye*, 293 F 1013 (D.C. Cir. 1923); *Daubert v. Merrell Dow Pharm., Inc.*, 509 U.S. 579 (1993).

<sup>27</sup> Of course, the term ‘advice’ might be a way of neutralizing attempted intervention. Whether the report constitutes advice (or meddling) and the perceived audience(s) all seem to be up for grabs. The nature of the ‘advice’ is especially interesting.

<sup>28</sup> SHEILA JASANOFF, *SCIENCE AT THE BAR* (1995); Sheila Jasanoff, *Making Order: Law and Science in Action* in *THE HANDBOOK OF SCIENCE AND TECHNOLOGY STUDIES* 761 (Edward J. Hackett et al. eds., 3d ed. 2007); DAVID S. CAUDILL & LEWIS H. LARUE, *NO MAGIC WAND: THE IDEALIZATION OF SCIENCE IN THE LAW* (2006); Gary Edmond, *Judging Facts: Managing Expert Knowledges in Legal Decision-Making*, in *EXPERTISE IN REGULATION AND LAW* 136 (Gary Edmond ed., 2004).

<sup>29</sup> MICHAEL LYNCH ET AL., *TRUTH MACHINE: THE CONTENTIOUS HISTORY OF DNA PROFILING* 106 (2008).

<sup>30</sup> See also Gary Edmond, *What Lawyers Should Know About the Forensic “Sciences”*, 36 *ADELAIDE L. REV.* 33 (2015).

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.<sup>31</sup>

We believe this sentence is crucial because the issue of the validity of forensic science claims was at the crux of two decades of skirmishes over forensic science evidence that preceded publication of the report.<sup>32</sup> We also contend that, far from being a cherry-picked criticism, the claim made in this sentence is explicated and supported throughout the text of the report. Finally, we wish to emphasize that the sentence contains two propositions: first that many forensic science disciplines failed to establish their validity and accuracy; and, second, that courts across the United States failed to demand such evidence as a condition of use in criminal proceedings. With this second proposition, the NRC Committee itself has expressed a view relevant to the central question posed in our study: whether the courts have revealed a peculiar resistance to criticism of forensic science evidence. The NRC Committee would seem to answer this question in the affirmative.<sup>33</sup>

Closely related to this issue is the question of whether *Strengthening* speaks to legal practice and admissibility gatekeeping in particular. NRC Committee Co-Chair, Judge Harry Edwards' statement to a Congressional committee contained the important disclaimer: "whether forensic evidence in a particular case is admissible under applicable law is not coterminous with the question whether there are studies confirming the scientific validity and reliability of a forensic science discipline."<sup>34</sup> A number of prosecution briefs invoked these words in response to defense attempts to enlist the findings of *Strengthening* in contests over the admissibility of forensic science evidence. One brief stated: "[i]n fact, the Honorable Harry T. Edwards, Co-Chair of the NRC Forensic Science Report, has stated on

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<sup>31</sup> NRC report, *supra* note 8, at 53. Lest we be considered (to have become) positivists, an additional caveat is in order. We interpret *Strengthening* as a critical response to the forensic sciences and legal institutions routinely relying on their evidentiary products. Further, we believe that the findings and recommendations should be taken seriously and considered at a policy level, especially by appellate and supreme courts. The NAS Report should have exerted a stronger and more conspicuous influence on admissibility jurisprudence and decision making, the form of opinions admitted, and shaken judicial confidence in the value of trial safeguards and judicial review. We believe that *legal* values, such as the commitment to "truth and justice" require directing attention to the validity and reliability of forensic science techniques in routine use in criminal proceedings. Notwithstanding these commitments, we are reluctant to buy into the essentialist way in which *Strengthening* characterizes "science" when strategically juxtaposing it to the contemporary *forensic sciences*. The sciences, and here we deliberately move beyond the forensic sciences, are more complex and variegated than such a reductionist reading suggests.

<sup>32</sup> The so-called "DNA wars" form part of these skirmishes. The early controversy around DNA evidence was contested in and out of courts and was largely resolved through a series of extra-legal reports produced by NRC committees. See JAY D. ARONSON, *GENETIC WITNESS: SCIENCE, LAW, AND CONTROVERSY IN THE MAKING OF DNA PROFILING* (2007) and DAVID H. KAYE, *THE DOUBLE HELIX AND THE LAW OF EVIDENCE* (2010).

<sup>33</sup> See, e.g., NRC report, *supra* note 8, at 85, 12, 53, 96, 109, 110.

<sup>34</sup> Statement of Judge Harry T. Edwards, Co-Chair, Committee on Identifying the Needs of the Forensic Science Community, Committee on the Judiciary, United States Senate (Mar. 18, 2009).

the public record that the report is not intended to affect the admissibility of any forensic evidence.”<sup>35</sup> The slippage, of course, is between a report focused on questions of admissibility and a report explicitly directed to validity which, as such, might reasonably be expected to “affect” a *court* determining admissibility. *Strengthening* is not the former. Few NRC reports are. Of eight NRC reports on forensic science evidence, only one explicitly rendered an opinion on the admissibility of the evidence.<sup>36</sup> However, it seems more difficult to question the contention that *Strengthening* is a scientific report that should “affect” a court’s assessment of the admissibility of forensic science evidence; especially in federal (and some state) courts in the aftermath of *Daubert*, *Kumho* and revision to rule 702 of the Federal Rules of Evidence (FRE). Revealingly, Judge Edwards subsequently characterized prosecutors’ invocation of his words as “a blatant misstatement of the truth. I have never said that the Committee’s Report is ‘not intended to affect the admissibility of forensic evidence’ ... To the degree that I have commented on the effect of the Report on admissibility determinations, I have said something quite close to the opposite of what these briefs assert.”<sup>37</sup> Thus, while it is undoubtedly correct to say that *Strengthening* does not advise on admissibility, it would seem to be misleading to suggest that it is not relevant to admissibility determinations. Nonetheless, the confusion persists, as we shall see.

## B. CASES

In order to generate our dataset, we conducted a Westlaw search for the terms “Strengthening the Forensic Sciences”, “National Research Council”, “NRC”, “National Academy of Sciences” and “NAS” after 2008. This produced 82 cases in which *Strengthening* was cited.<sup>38</sup> Obviously, this is not a representative sample of events in American courtrooms. However, it is a (near) comprehensive sample of reported cases that, for one reason or another, have attempted to engage with *Strengthening*, usually in response to challenges to the admissibility or probative value of incriminating forensic science evidence. These judicial responses form part of the set of texts that American lawyers treat as “the law.” Indeed, they represent official legal responses to the NRC report and its implications. Already, in the few years since it was published, the cases in our sample provide authoritative resources for managing (defendants’) recourse to the report. These cases, particularly some of the earlier appellate decisions, provide legally-based means of qualifying the applicability and significance of criticisms embodied in *Strengthening*. The exclusionary, inoculating and avoidance strategies employed in initial trials and appeals have been rehearsed in subsequent litigation. See Table 1 for descriptive statistics about this set of cases.

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<sup>35</sup> United States v. Faison, 393 Fed. Appx. 754 (2010). See also United States v. Rose, 672 F. Supp.2d 723, 725 (D. Md. 2009); United States v. Cerna, 2010 WL 3448528 (N.D. Cal. 2010).

<sup>36</sup> Simon A. Cole, National Academy of Sciences (NAS), *ENCYCLOPEDIA OF FORENSIC SCIENCES* 190 (2013); David H. Kaye, *Bullet-proofing the NRC Bullet Lead Report: Should Science Committees Make Legal Findings?*, 46 *JURIMETRICS* 91 (2005). See also Section IV.

<sup>37</sup> Harry T. Edwards, *The National Academies of Sciences Report on Forensic Sciences: What it Means for the Bench and the Bar*, 51 *JURIMETRICS* 1 (2010).

<sup>38</sup> Search conducted 2 June 2014.

Table 1. Descriptive statistics of cases comprising data set.

<b>Jurisdiction</b>	<b>Count</b>
US Supreme Court	2
Federal Circuit Court	3
Federal District Court	23
Total Federal	28
State Supreme Court	28
State appellate court	25
State trial court	1
Total State	54
Total	82
<b>Year</b>	<b>Count</b>
2009	5
2010	20
2011	18
2012	14
2013	16
2014	9
Total	82
<b>Primary types of forensic evidence (some cases include more than one)</b>	<b>Count</b>
Latent prints	27
Firearm and toolmark	22
Drug analysis	7
Forensic pathology	5
DNA	4
Arson evidence	2
Bite marks	2
Shoe prints	2
Hair comparison	2
Blood spatter	2
Handwriting	2
Addiction medicine	1
Canine	1
Gunshot residue	1

Alcohol testing	1
Image analysis	1
Psychological assessment	1
Tire prints	1
Trace evidence	1
<b>Procedural Posture</b>	<b>Count</b>
Direct appeal	44
Trial motion	19
Habeas corpus action	9
Other post-conviction action	7
Consolidated direct and post-conviction appeal	1
Interlocutory appeal	1
Sentencing hearing	1
Total	82
<b>Success of challenge</b>	<b>Count</b>
Successful	14
Unsuccessful	68
Total	82

### C. LEGAL CONTEXT

In undertaking this analysis, and endeavoring to develop a clearer understanding of legal responses to *Strengthening* in the United States, it is vital to recognize the institutional and professional position of judges (and lawyers).<sup>39</sup> There are many factors influencing the circumstances in which *Strengthening* may come before courts, as well as the terms on which it may be considered, accepted or avoided. All references to the report appear in relation to specific cases; whether during prosecutions, direct appeals or some other post-conviction review process.

Most references to the NRC report in our dataset are in response to: claims through direct appeal (e.g. failure to have had an admissibility hearing, failure to exclude or qualify opinions, and sometimes ineffective counsel or evidence insufficient; n=44); admissibility challenges in the trial court (e.g. motions to hold an admissibility hearing and/or motion to exclude; n=19); habeas corpus petitions

<sup>39</sup> *Strengthening* has a life of its own in foreign jurisprudence. See, e.g., the following English and Canadian cases: R. v. Otway, [2011] EWCA Crim 3; R. v. Smith, [2011] EWCA Crim 1296; R. v. Aitken, [2012] BCCA 134; R. v. Bornyk [2013] BCSC 1927; Tuite v. The Queen [2015] VSCA 148.

(to federal courts; n=9) and other post-conviction relief applications (to state courts, sometimes based on legislation enacted or refined in response to DNA exonerations; n=7) claiming that the incriminating forensic science evidence was insufficiently reliable to have been admitted or that concerns about reliability raise fresh doubts about the original conviction.<sup>40</sup> There are quite a few references to jurisdictional admissibility standards, particularly ‘general acceptance’ in relation to the admissibility challenges in state courts.

It is, in consequence, necessary to direct attention to legal procedures and rules that govern: the admissibility of expert evidence (such as *Frye*, FRE r702 and *Daubert/Kumho*); the manner of determining admissibility (e.g. *Frye/Kelly* or *Daubert/Lanigan* hearing); the use of the NRC report as a learned treatise; the obligation to take notice of previous admissibility decisions and whether they are binding on the court; the standard of review for the discretionary decisions of trial judges (and whether timely objections were made); and habeas corpus and post-conviction applications.<sup>41</sup> As we shall see, the intense focus on the case, the particular witness, their opinion and its relation to facts in issue, tends to make it difficult to introduce, let alone transform, general concerns from *Strengthening* into specific case-based evidence relevant to prosecutions and appeals. These difficulties tend to be magnified with displacement from the trial.

We can obtain some sense of the way legal processes shape the reception and representation of *Strengthening* through direct appeals. Those questioning the admissibility of forensic science evidence and its significance on appeal are required to show not only that the evidence might be insufficiently reliable (or was exaggerated) according to the jurisdictional admissibility standards—in a manner that might resonate with some of the findings and recommendations in *Strengthening*—but that the judge made a substantial error or abused a discretion. This is an onerous standard, and it does not involve the court of review substituting its own preference for what the trial judge did. For the appeal to succeed, the original decision must be shown to be manifestly mistaken (or misguided)—an abuse of the broad discretion conferred upon trial judges. However, even where a party convinces an appellate court that evidence was admitted in error, abuses of discretion and other mistakes might be excused where a court of appeal is satisfied, notwithstanding the erroneous admission (or exaggerated claims by a forensic analyst), that the conviction nevertheless remains sound. In the absence of strong evidence of innocence (e.g. fresh evidence, such as exonerating DNA testing results), serious prosecutorial misconduct, or egregious performances by defense lawyers, appellate judges encounter genuine difficulty interfering with convictions. The difficulty of retrospectively persuading an appellate court that a jury verdict is mistaken, a trial was substantially unfair, or involved an abuse of rights, reinforce the importance of having unreliable and speculative expert evidence excluded or moderated before admission (and the need to raise objections and reliability issues before trial). The chance of having admissibility decisions treated as mistaken, in a manner that provides access to a re-trial or acquittal, is remote.

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<sup>40</sup> There was also one interlocutory appeal, one sentence hearing and one consolidated hearing.

<sup>41</sup> See *Commonwealth v. Lanigan*, 419 Mass. 15, 20, 641 N.E.2d 1342 (1994); *People v. Kelly*, 17 Cal.3d 24 (1976).

At every stage, from pre-trial motions to exclude evidence or hold admissibility hearings to (re-)consider admissibility, to post-trial review of admissibility, to determinations of whether the NRC report creates sufficient doubt to unsettle conviction (as newly discovered evidence), legal rules and categories mediate the claims of defendants, appellants and petitioners as well as the evidence that will be recognized and received. Legal rules and standards predominate to the extent that courts can even avoid engaging with the NRC report by insisting that any implications raised by it are not properly before them. That is, the applicant/appellant has not embedded the NRC report in a legally recognizable form.<sup>42</sup>

Moreover, trial and appellate judges in adversarial systems are generally not in a position to unilaterally invoke reports—however authoritative—or to undertake their own inquiries. The evidence adduced in trials and reviewed on appeals is selected and presented by the parties. Trial and appellate judges are dependent on the way prosecutors, and poorly resourced defendants (and prisoners), respond to allegations, exogenous critique, and contest the admissibility and use of evidence.<sup>43</sup> Legal rules, traditions of practice and an institutional conservatism, particularly an aversion to some types of risk, all shape judicial decision-making. A commitment to finality along with confidence in adversarial trial procedures means that the disruptive implications of reversing earlier accommodating admissibility practices exert particularly strong professional influences that constrain the way critical perspectives might be read or incorporated into the jurisprudence dedicated to admissibility and proof.<sup>44</sup>

This is not to suggest that trial and appellate judges are hamstrung, or without autonomy and discretion. Most of the judges and courts in our sample could have been far more receptive to the NRC report and its implications. There are, however, a range of pressures, assumptions and commitments. By way of forewarning, the commitment to adversarial (i.e. party controlled) proceedings, systemic under-resourcing of the defense, poor performances by many defense lawyers, along with the lack of disclosure or engagement by prosecutors and forensic analysts, and the threat to social legitimacy and finality raised by formally acknowledging widespread problems, helps to explain the marginal status of *Strengthening* in courts and judgments five years after its publication. Of the tens of thousands of contested cases where the state relied substantially on expert comparison and identification evidence, less than one hundred published cases have even cited *Strengthening* and less than a fifth of these have responded in a manner that might be considered broadly consistent with the concerns expressed in the report. *Strengthening* appears to have been little more than a legal hiccup, and its influence is likely to recede over time, particularly as some of the recommendations gradually work their way into forensic science practice under the supervision of the National Institute of Standards and Technology (NIST), and

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<sup>42</sup> See, e.g., *Ohio v. Langlois*, 2 N.E.3d 936 (2013); *Jones v. United States*, 27 A.3d 1130, 1137-8 (2011).

<sup>43</sup> But see Gertner, *supra* note 24.

<sup>44</sup> See, e.g., *United States v. Watkins*, 450 Fed. Appx. 511 (C.A.6 (Ohio) 2011); *Dennis v. Florida*, 109 So.3d 680 (2013); *Gee v. United States*, 54 A.3d 1249 (2012).

threats are inoculated by early legal evasions solidifying into precedent—see Section III.<sup>45</sup>

#### D. CASE-ORIENTED LAW (AND A GENERAL REPORT)

One vitally important aspect of the legal context is the common law obsession with the particular case.<sup>46</sup> In terms of evidence and proof, proceedings are profoundly case-based. Courts are interested in relevant—that is, probative—evidence bearing on facts in issue in the *specific* proceedings. *Strengthening* affords a general review focusing on prominent areas of forensic science and medicine. The recommendations flowing from the NRC report tend to be of a general nature: aimed at reforming the organization of the forensic sciences as well as the quality of the evidentiary products. As we shall see, the very specific (or *sui generis*) nature of adversarial legal proceedings, in contrast, has been used to limit the application and perceived implications of the report. Courts repeatedly suggest that *Strengthening* does not directly address the particular facts in issue in the case before them, even though findings and recommendations appear to have direct implications for the relevance and reliability of techniques used to generate the specific opinion evidence as well as its presentation.<sup>47</sup>

More problematic at an institutional level is the reluctance of individual courts, especially courts of appeal and supreme courts, to engage with some of the broader evidentiary, institutional and policy implications embedded in *Strengthening*. Courts of review have been unwilling, an unwillingness implicitly grounded in the case-based nature of legal practice, to make critical statements about the forensic sciences that might have implications for other trials and appeals, older convictions, or the performance of the system more generally. Such criticism would simultaneously question the effectiveness of trial safeguards and appeals and even the soundness of some convictions. But the opposite is not true, for courts have been willing to seed the case law with statements in support of forensic sciences—with the potential to become binding.

In theory, there is an expectation that issues will be resolved in the instant proceedings where well-informed parties carefully select and competently present evidence and legal argument to trial (and appellate) courts. This essay illustrates how far from this ideal we have ventured. Our study exposes the credulity of courts toward the effectiveness of their own process, a curiously persistent confidence in forensic science evidence adduced by the state, and the development and interpretation of rules and rationales that allow judges to insulate legal proceedings and performances from exogenous influences and perspectives without appearing to be ignorant, indifferent or even unjust. Presiding over legal systems with limited resources, appellate courts are reluctant to equate poor performance

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<sup>45</sup> With the National Institute for Justice, NIST was jointly responsible for EXPERT WORKING GROUP ON HUMAN FACTORS IN LATENT PRINT ANALYSIS, LATENT PRINT EXAMINATION AND HUMAN FACTORS: IMPROVING THE PRACTICE THROUGH A SYSTEMS APPROACH (2012).

<sup>46</sup> See, e.g., BRUCE A. KIMBALL, THE INCEPTION OF MODERN PROFESSIONAL EDUCATION: C. C. LANGDELL, 1826–1906 (2009) and more generally, see John Forrester, *If P, Then What? Thinking in Cases*, 9 HIST. HUM. SCI. 1 (1996).

<sup>47</sup> David L. Faigman et al., *Group to Individual (G2i) Inference in Scientific Expert Testimony*, 81 U. CHI. L. REV. 417 (2014).

and the impact of deficient resourcing with ineffectiveness and jury misunderstanding, or to conclude that weaknesses in the forensic science evidence were sufficient to render proceedings unfair.

## II. SUCCESSFUL CHALLENGES: CONFRONTATION, DRUG TESTS AND “BALLISTIC CERTAINTY”

With this background in mind, we move to consider our case sample. We begin with cases where legal outcomes seem to be consistent with the thrust of the NRC report. We coded 14 of the 82 cases (17%) as resulting in “successful” *Strengthening*-based challenges to forensic science evidence.<sup>48</sup> This is not quite as bleak a picture as that conveyed by Cooper and Epstein. What accounted for these “successes”?

### A. CONFRONTATION IN MELENDEZ-DIAZ

Given the widespread impression that *Strengthening* has exerted little impact on American courts, it might be thought curious that within a year of publication the report had been cited approvingly by the highest court in the land.<sup>49</sup> Perhaps even more surprising is the fact that the citation is found in a Supreme Court opinion written by Justice Scalia, a conservative law-and-order judge not generally considered sympathetic to criminal defendants trying to restrict the admission and use of forensic science evidence.

As is well known, however, Justice Scalia’s originalist judicial philosophy leads him to be pro-defendant in cases involving the Sixth Amendment (i.e. the “confrontation clause”) of the United States Constitution.<sup>50</sup> Thus, in his opinion in *Melendez-Diaz*, overturning a conviction in which a defendant was not able to cross-examine the analyst who had performed the drug testing, Scalia J cited *Strengthening* in response to the notoriously technophilic Justice Breyer’s argument that confrontation was not necessary for something as reliable as forensic science evidence. In this context, Justice Scalia invoked *Strengthening*—in a manner consistent with our suggested reading—as authority for his rejoinder: that cross-examination should be available because the forensic science evidence might not be as reliable as Justice Breyer asserted.

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<sup>48</sup> For the purposes of this essay we applied a binary coding scheme in which all cases were coded either “successful” or “unsuccessful.” Obviously, many cases yielded mixed results of one sort or another. In some cases, one type of forensic evidence was admitted and another excluded. These cases were resolved by determining whether the challenge that was grounded on *Strengthening* was successful or unsuccessful. In other cases, the forensic evidence was admitted, but the testimony was limited in some way. We have analyzed these decisions under the label “split testimony”.

<sup>49</sup> *Melendez-Diaz v. Massachusetts*, 129 S. Ct. 2527 (2009).

<sup>50</sup> Jennifer L. Mnookin & David H. Kaye, *Confronting Science: Expert Evidence and the Confrontation Clause*, SUP. CT. REV. (2012).

*Melendez-Diaz* spawned a wave of confrontation clause litigation, and 5 of the 14 “successful” cases are confrontation clause cases decided in its shadow.<sup>51</sup>

### B. PRESUMPTIVE DRUG TESTING

In only two of the eight other “successful” cases was *Strengthening* drawn upon as authority in justifying the outcome. Both of these cases concerned presumptive drug tests.<sup>52</sup> Significantly, half of the six successful “confrontation clause” cases also involved presumptive drug tests.<sup>53</sup> In these cases *Strengthening* is used as an authoritative source for the limits of presumptive testing and the need for more reliable gas chromatography-mass spectrometry (GC-MS) analysis in order to make scientifically-based conclusions about the type of substances recovered by police officers.<sup>54</sup> Here, the report was invoked to discipline investigative performance. For, in contrast to most of the forensic techniques criticized in *Strengthening*, the report confirmed the existence of a validated instrumental technique for analyzing unknown substances that was widely available but had not been utilized by investigators.

At one level the presumptive drug tests are easy to distinguish from some of the other forensic science practices. There are, after all, standardized assays from mainstream chemistry suited to determining the composition of questioned substances—such as the type and purity of suspected narcotics. And, many of the police and others purporting to proffer opinions were not trained in these methods or did not use them. In these cases, attentive courts could simply juxtapose the performance of police and forensic analysts with what was widely accepted should have been done (and is done routinely in many jurisdictions across the U.S.).<sup>55</sup> When unequivocally reliable methods exist, courts seem unwilling to condone the use of *insufficiently* reliable methods.<sup>56</sup> Judges and courts seem willing to denounce the failure to use validated tests and empirically-derived standards *where they are available*.<sup>57</sup> However, as we shall see in subsequent sections, where validated alternatives are not available, the lack of validation is not used to constrain admissibility. Rather, the lack of demonstrably reliable alternatives seems to lead judges to allow analysts to persist with their traditional, though untested, practices and claims, albeit sometimes requiring modification to the forms of ex-

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<sup>51</sup> *Melendez-Diaz*, 129 S. Ct.; *New York v. Carreira*, 893 N.Y.S.2d 844 (2010); *Commonwealth v. Vasquez*, 923 N.E.2d 524 (2010); *New Mexico v. Jaramillo*, 272 P.3d 682 (2011); *Commonwealth v. King*, 960 N.E.2d 894 (2012); *New Mexico v. Navarette*, 294 P.3d 435 (2013).

<sup>52</sup> *North Carolina v. Ward*, 694 S.E.2d 738 (2010); *Connecticut v. Martinez*, 69 A.3d 975 (2013).

<sup>53</sup> *Melendez-Diaz*, 129 S. Ct.; *King*, 960 N.E.2d; *Vasquez*, 923 N.E.2d.

<sup>54</sup> *Melendez-Diaz*, 129 S.Ct. at 2537, recognizes that there are common errors in the use of GC-MS that may make cross-examination desirable; *King*, 960 N.E.2d, 898 n5; *Martinez*, 69 A.3d at 536. Note the use of legal authority alongside non-legal authority in *Martinez*, at 567.

<sup>55</sup> Compare *Commonwealth v. Fernandez*, 934 N.E.2d 810 (2010) and *United States v. Aman*, 748 F. Supp.2d 531 (E.D. Va. 2010).

<sup>56</sup> In *North Carolina v. Ward*, 694 S.E.2d 738 (2010) the court chides the state for its failure to fund “[s]upremely qualified”—i.e. tertiary trained and highly experienced—chemists to use appropriate testing regimes.

<sup>57</sup> See, e.g., *King*, 960 N.E.2d; *Fernandez*, 934 N.E.2d; *Martinez*, 69 A.3d.

pression. Prior admission, confidence in trial safeguards and the lack of alternative techniques make (precipitous) exclusion a difficult and institutionally disruptive response.

### C. QUALIFIED “SUCCESS”

In several motions and appeals, the defendant/appellant was able to persuade a court that there were problems with the expert evidence, in part relying upon the NRC report. In most cases where a defendant/appellant was able to influence the court to modify its approach to a type of evidence, the change was in the way the expert’s conclusion was expressed rather than exclusion. The two most prominent responses were, first, to require the analyst to make clear that the evidence they are proffering is merely their opinion.<sup>58</sup> This is sometimes described as *opinionization*.<sup>59</sup> The second response is to require the analyst to temper the strength of the claim. We can observe both of these responses in the following extracts:

However, because of the limitations on the reliability of firearms identification evidence discussed above, Mr. Nichols will not be permitted to testify that his methodology allows him to reach this conclusion as a matter of scientific certainty. Mr. Nichols also will not be allowed to testify that he can conclude that there is a match to the exclusion, either practical or absolute of all other guns. He may only testify that, in his opinion, the bullet came from the suspect rifle to within a reasonable degree of certainty in the firearms examination field.<sup>60</sup>

While we accept that some of these forms of tempering, or “splitting,” the evidence may be more appropriate (or, more precisely, less misleading), we have elsewhere raised questions about whether the tempered formulations capture or meaningfully convey actual limitations.<sup>61</sup> Such legal responses tend to produce compromises that appear, at least superficially, to accommodate findings and recommendations from the NRC report but in actuality may not make any practical difference. For example, in one case, the court wrote:

In light of our ruling today and the findings of the NRC report, we offer the following guidelines to ensure that expert forensic ballistics testimony appropriately assists the jury in finding the facts but does not mislead by reaching beyond its scientific grasp. First, before trial, the examiner must adequately document the findings or observations that support the examiner’s ultimate opinion ... Second, before an opinion is offered at trial, a forensic ballistics expert should explain to the jury the theories and methodologies underlying

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<sup>58</sup> *Commonwealth v. Joyner*, 4 N.E.3d 282, 289-90 (2014) quoting *Commonwealth v. Gambora*, 457 Mass. 715, 736-37 (2010), concurring and harmless error. *See also Commonwealth v. Wadlington*, 467 Mass. 192, 205-06 (2014).

<sup>59</sup> Simon A. Cole, *The ‘Opinionization’ of Fingerprint Evidence*, 3 *BIOsocieties* 105 (2008).

<sup>60</sup> *United States v. Taylor*, 663 F. Supp.2d 1170, 1180 (D.N.M. 2009). *See also United States v. Sebborn*, 2012 WL 5989813 (E.D.N.Y. 2012); *Melcher v. Holland*, 2014 WL 31359, 13 (N.D. Cal. 2014); *United States v. Willock*, 696 F. Supp.2d 536, 546 (D. Md. 2010).

<sup>61</sup> Cole, *supra* note 16; Simon A. Cole, *Individualization Is Dead, Long Live Individualization! Reforms of Reporting Practices for Fingerprint Analysis in the United States*, 13 *LAW, PROBABILITY & RISK* 117.

the field of forensic ballistics. ... Third, in the absence of special circumstances casting doubt on the reliability of an opinion ... [w]here a qualified expert has identified sufficient individual characteristic toolmarks reasonably to offer an opinion that a particular firearm fired a projectile or cartridge casing recovered as evidence, the expert may offer that opinion to a ‘reasonable degree of ballistic certainty.’<sup>62</sup>

These kinds of responses seem to be a triumph of form over substance.

Neither opinionisation nor tempering expressions in subtle gradations would seem to provide credible responses to the substantial issues raised in the NRC report and elsewhere.<sup>63</sup> Does opinionisation overcome the lack of validation testing and standardization at the heart of the NRC critique? Does it really matter if a claim about a match is described as a match between prints or the examiner’s opinion about two prints matching? Tweaking the form of expression, and subtle manipulation of the level of certainty, would not appear to capture limitations or render the evidence susceptible to comprehension and rational evaluation by those charged with fact-finding or reviewing facts.<sup>64</sup>

As “successes”, the cases in this group might be interpreted as something of a pyrrhic victory.

### III. UNSUCCESSFUL CHALLENGES: MEDIATING AND INOCULATING “SCIENCE”

What of the “unsuccessful” cases? We sought to understand what rationales enabled courts to render defendants’ challenges “unsuccessful” despite the invocation of *Strengthening*. We identified several themes that featured among the judicial justifications.

#### A. SCIENCE OR LAW? THE NRC REPORT IS NOT LEGAL

Consistent with Cooper’s finding, one very prominent means of marginalizing the report and its apparent implications is by characterizing it as a text that is not legal or legally oriented.<sup>65</sup> Numerous judges and courts referred to the report as an important intervention, and even an intervention that was unsettling

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<sup>62</sup> *Commonwealth v. Pytou Heang*, 458 Mass. 827, 842-8 (Mass. 2010).

<sup>63</sup> See, e.g., Adina Schwartz, *A Systemic Challenge to the Reliability and Admissibility of Firearms and Toolmark Identification*, 6 COLUM. SCI. & TECH. L. REV. 2 (2004). Consider the treatment of Schwartz’s evidence in *United States v. Otero*, 849 F. Supp.2d 425 (D.N.J. 2012); *Willcock*, 696 F. Supp.2d; *United States v. Taylor*, 663 F. Supp.2d 1170 (D.N.M. 2009); *Henry v. Florida*, 125 So.3d 745, 751 (2013).

<sup>64</sup> See Dawn McQuiston-Surrett & Michael J. Saks, *The Testimony of Forensic Identification Science: What Expert Witnesses Say and What Factfinders Hear*, 33 LAW & HUM. BEHAV. 436 (2009).

<sup>65</sup> Consider GEOFFREY C. BOWKER & SUSAN STAR, *SORTING THINGS OUT: CLASSIFICATION AND ITS CONSEQUENCES* (1999); THOMAS F. GIERYN, *CULTURAL BOUNDARIES OF SCIENCE: CREDIBILITY ON THE LINE* (1998).

and required institutional responses.<sup>66</sup> These responses would, however, need to take place elsewhere. For the judges characterizing *Strengthening* as scientific, policy or reform-oriented, this threw light on the condition of the forensic sciences but provided limited insight into how legal institutions should respond to forensic science evidence either in general or more specifically. Most judges and courts responded to the report on the basis that it was not a legal document, did not have much (for many, anything) to say about specific legal (as opposed to forensic science) practice and that any revelations could be adequately managed through conventional legal trial safeguards and protections (such as vigorous cross-examination, rebuttal witnesses and careful instructions from trial judges).<sup>67</sup>

Perhaps the clearest expression of this response can be found in the *Melendez-Diaz* dissent:

The Court [the majority] therefore errs when it relies in such great measure on the recent report of the National Academy of Sciences. That report is not directed to this Court, but rather to the elected representatives in Congress and the state legislatures, who, unlike Members of this Court, have the power and competence to determine whether scientific tests are unreliable and, if so, whether testimony is the proper solution to the problem.<sup>68</sup>

In both *Frye* and *Daubert* jurisdictions, courts were unwilling to conclude that findings and recommendations from the NRC report dictated admissibility:

While certainly important for advancing the methodologies of the various forensic sciences, the NRC reports are simply not dispositive of the legal issue here.<sup>69</sup>

As noted above, the claim that the NRC report is not oriented to law and legal practice was sometimes reinforced by direct appeal to the words of Judge Edwards. Many courts, possibly through poor defense presentation and/or judicial confusion, construed defense challenges based on *Strengthening* to be arguing that the report dictated a particular admissibility outcome, rather than that, as an authoritative statement, it should carry weight with a judge required to make an admissibility (or some other) determination.

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<sup>66</sup> See, e.g., *Minnesota v. Hayes*, 831 N.W.2d 546 (2013); *Pennsylvania v. Edmiston*, 65 A.3d 339 (2013); *Robbins v. Texas*, 360 S.W.3d 446 (2011); *Illinois v. Mitchell*, 955 N.E.2d 1180 (2011); *United States v. Zajac*, 749 F. Supp.2d 1299 (2010); *Willock*, 696 F. Supp.2d.

<sup>67</sup> *Ohio v. Langlois*, 2 N.E.3d 936, 945-6 (2013); *United States v. Aman*, 748 F. Supp.2d 531, 536 (E.D. Va. 2010); *Pettus v. United States*, 37 A.3d 213, 228 (2012); *Commonwealth v. Gambora* 457 Mass. 715, 725 (2010); *Melendez-Diaz v. Massachusetts*, 129 S.Ct. 2527, 2555 (2009).

<sup>68</sup> *Melendez-Diaz*, 129 S. Ct. at 2555.

<sup>69</sup> *Langlois*, 2 N.E.3d at 945-46. The *Langlois* Court also referred to NRC, BALLISTIC IMAGING (2008). See also *Johnston v. Florida*, 27 So.3d 11, 21 (2010); *Illinois v. Luna*, 989 N.E.2d 655, 674 (2013); *Pettus*, 37 A.3d at 227.

B. LIBERAL ADMISSION: “SUFFICIENTLY RELIABLE” FORENSIC SCIENCE EVIDENCE

In other cases, courts recognized the existence of criticisms but were unwilling to accept that they rendered techniques of considerable provenance insufficiently reliable for admission—under *Frye* or *Daubert*.<sup>70</sup> One of the overarching or background factors informing courts’ approaches to admissibility is a commitment to the admission of relevant evidence. This is part of a long tradition flowing through Thayer and Wigmore (from Bentham) and associated with recent and more accommodating interpretations of rules regulating expert evidence (in criminal proceedings).<sup>71</sup> *Daubert*’s rejection of “general acceptance” as the sole or primary admissibility criterion was said to reflect the “liberal thrust’ of the Federal Rules and their ‘general approach of relaxing the traditional barriers to ‘opinion’ testimony’”.<sup>72</sup> The commitment to a liberal admissibility scheme has the benefit of being consistent with overarching principle and simultaneously explaining the admissibility of less than perfect forensic science evidence.<sup>73</sup>

The NAS report does not conclude that fingerprint evidence is so unreliable that courts should no longer admit it.<sup>74</sup>

Notwithstanding explicit admissibility standards based around reliability and/or acceptance, on review some courts were apparently satisfied with the foundational claims of forensic science techniques being “plausible.”<sup>75</sup>

Liberal admission enables courts to contrast legal admissibility—including standards requiring reliability—with much more onerous expectation of certainty or even infallibility credited to science. The courts’ notion of “sufficient” reliability is more a *gestalt* judgment than a specified degree of reliability. Indeed, in extreme cases, courts deemed it not an abuse of discretion to admit testimony even when the judge accepted that the state’s expert witness was overstating the probative value of the evidence.<sup>76</sup> For instance, in one case, it was reasonable for the court to admit testimony that a technique (latent fingerprint identification)

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<sup>70</sup> *United States v. Cerna*, 2010 WL 3448528, 4-5 (N.D. Cal. 2010). See also *Coronado v. Texas*, 384 S.W.3d 919, 927-28 (2012); *Aman*, 748 F. Supp.2d at 542; and *Johnston*, 27 So.3d at 20-21. *Dennis v. Florida*, 700 (2013) and *Henry v. Florida* (2013) both cited *Johnson*. See also *Foster v. Florida*, 132 So.3d 40, 72 (2014); *Enderle v. Iowa*, 2014 WL 956818, 9; *Hooper v. Warden, Northern New Hampshire Correctional Facility*, 2010 WL 1233968, 6-7; *Gambora*, 457 Mass. at 725; *United States v. Herrera*, 704 F.3d 480, 485-7 (2013).

<sup>71</sup> WILLIAM TWINING, THEORIES OF EVIDENCE: BENTHAM AND WIGMORE (1985).

<sup>72</sup> *Daubert v. Merrell Dow Pharm., Inc.*, 509 U.S. 579, 588 (1993).

<sup>73</sup> *United States v. Otero*, 849 F. Supp.2d 425, 438 (D.N.J. 2012).

<sup>74</sup> *Gambora*, 457 Mass. at 725-27.

<sup>75</sup> On plausibility, see *Illinois v. Luna*, 989 N.E.2d 655, 674 (2013); *United States v. Willock*, 696 F. Supp.2d 536, 568 (D. Md. 2010); *Commonwealth v. Gambora*, 933 N.E.2d 50, 60 (2010); *North Carolina v. Leonard*, 726 S.E.2d 647, (2013); *Commonwealth v. Joyner*, 4 N.E.3d 282, 289-90 (2014); *Minnesota v. Hayes*, 567.

<sup>76</sup> See examples of exaggeration in BRANDON L. GARRETT, CONVICTING THE INNOCENT: WHERE CRIMINAL PROSECUTIONS GO WRONG (2012) and NATIONAL RESEARCH COUNCIL, FORENSIC ANALYSIS: WEIGHING BULLET LEAD EVIDENCE (2004).

was “100% accurate” because “even a less than-perfect fingerprint-identification method can still be scientifically valid.”<sup>77</sup> In another,

The Court further recognizes, as did the National Research Council’s report, that claims for absolute certainty as to identifications made by practitioners in this area [toolmark comparison] may well be somewhat overblown. The role of this Court, however, is much more limited than determining whether or not the procedures utilized are sufficient to satisfy scientists that the expert opinions are virtually infallible.<sup>78</sup>

Here the court uses the familiar tactic of invoking the straw man of “infallibility,” attributing to the defendant the absurd position that *Daubert* requires scientific evidence to be error free. When the exaggerated expectation is debunked, the court suggests that admissibility must be the logical conclusion. There is an irony here because it was forensic science disciplines—notably fingerprints, firearms and toolmarks—that originally invoked infallibility. Indeed, the commitment to the possibility of “infallibility” lay behind *Strengthening’s* contention that some of the forensic sciences are basically “unscientific.”<sup>79</sup>

### C. ENDORSEMENT

Another tactic was not to treat *Strengthening* as critical of the forensic sciences, either in general or in relation to the evidence in question. Through selection and emphasis, treating descriptive statements as evaluative, and over-interpreting faint praise, a number of courts construed *Strengthening* as an endorsement of the impugned evidence:

In our view, however, it exaggerates the measured conclusions and recommendations of the Report to read them as a rejection of the scientific basis for all pattern-matching analysis, including handwriting identification. The Report is much more nuanced than that. It ranges over a wide variety of forensic science disciplines and identifies weaknesses (and some strengths) of varying degrees in each. Thus, while pointing to the ‘simple reality... that the interpretation of forensic evidence is not always based on scientific studies to determine its validity,’ it finds “important variations [in terms of validity] among the disciplines relying on expert interpretation [of observed patterns].”<sup>80</sup>

In another case:

In any event, and contrary to Luis’s contention, the report does not conclude that blood spatter analysis is unreliable. The report notes that ‘[u]nderstanding how a particular bloodstain pattern occurred *can be* critical physical evidence, because it *may help* investigators understand the events of the crime.’<sup>81</sup>

<sup>77</sup> United States v. Watkins, 450 Fed. Appx. 511, 4 (C.A.6 (Ohio) 2011). See also The People v. Jones, 2013 WL 5397389 (Cal. App. 2 Dist 2013).

<sup>78</sup> *Otero*, 849 F. Supp.2d at 438.

<sup>79</sup> See also Michael J. Saks & Jonathan J. Koehler, *The Individualization Fallacy in Forensic Science*, 61 VAND. L. REV. 199 (2008); Simon A. Cole, *Forensic Without Uniqueness, Conclusions Without Individualization: The New Epistemology of Forensic Identification*, 8 LAW, PROBABILITY & RISK 233 (2009).

<sup>80</sup> *Pettus v. United States*, 37 A.3d 213, 227 (2012).

<sup>81</sup> *Commonwealth v. Vasquez*, 923 N.E.2d 524, 798-99 (2010) (emphasis added).

D. PRECEDENT (AND UNSTATED INSTITUTIONAL IMPLICATIONS)

Courts were also able to discount pejorative implications attributable to *Strengthening* on the basis that jurisdictional practice both before and after the report had tended to dismiss challenges to the admissibility of most forensic science techniques:

... counsel cites a 2009 National Research Council (NRC) report, which opined that latent fingerprint analysis, as well as other forensic identification methods, has not ‘been rigorously shown to have the capacity to consistently and accurately demonstrate a connection between evidence and a specific individual source.’... However, over 100 years ago, our supreme court found that there is a scientific basis for fingerprint identification and that courts are justified in admitting this class of evidence. Since then, federal and state appellate courts have uniformly rejected challenges to latent fingerprint analysis.<sup>82</sup>

Another court was less diplomatic: “[w]e are not prepared to throw out decades of precedent based on a single report.”<sup>83</sup>

And, the nature of precedent is such that once one court has invoked earlier decisions as a means of mediating *Strengthening*, that opinion itself may be cited as persuasive, or even binding, authority:

The Attorney General responds: ‘The [N.R.C.] study appellant cites has not persuaded other courts that it established any change in the opinion of the scientific community or warranted exclusion of latent fingerprint evidence.’<sup>84</sup>

E. FIELD-WORK

Whatever authority *Strengthening* may be said to possess derives in large measure from its claim to represent “science” or—to use legal terminology derived from the *Frye* decision—“the relevant scientific community” (RSC). However, what counted as the RSC in court was open to contestation and strategic “boundary-work.”<sup>85</sup>

In any case, it does appear that the use of ‘pattern matching’ to determine whether or not there is a match, an approach which, in one form or another, underlies both AFTE [Association of Firearm and Toolmark Examiners] and CMS [consecutive matching striae], is generally accepted among firearms examiners in the field.<sup>86</sup>

Another court acknowledged the “kernel of truth” that “[t]he NAS report does demonstrate some hesitancy in accepting latent fingerprint analysis on the

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<sup>82</sup> *Illinois v. Morris*, 997 N.E.2d 847, 871 (2013). In *Morris* at 860, the analyst ‘identified the print as defendant’s to the exclusion of all other individuals in the world.’ See also Cooper, *supra* note 14.

<sup>83</sup> *North Carolina v. Leonard*, 726 S.E.2d 647 (2013) cited Ulery et al. See also *United States v. Rose*, 672 F. Supp.2d 723, 725 (D.Md. 2009); *Jones v. United States*, 27 A.3d 1130, 1137-38 (2011).

<sup>84</sup> *People v. Jones*, 2013 WL 5397389, (Cal. Ct. App. 2d, 2013).

<sup>85</sup> Thomas F. Gieryn, *Boundary-Work and the Demarcation of Science from Non-Science: Strains and Interests in Professional Ideologies of Scientists*, 48 AM. SOC. REV. 781 (1983).

<sup>86</sup> *United States v. Taylor*, 663 F. Supp.2d 1170, 1178-79 (2009).

part of the broader scientific community.”<sup>87</sup> However, the defendant did “not dispute that the forensic science and law enforcement communities strongly support the use of friction ridge analysis,” and the court felt that “[a]cceptance in that narrower community is also relevant to the *Daubert* inquiry,” enabling it to conclude “that the general acceptance factor at least weakly supports the admission of latent fingerprint evidence.”<sup>88</sup>

Contestation over whether the RSC should be construed narrowly or broadly is endemic to a *Frye* analysis. Previous work has discussed some of the history of these disputes, noting that narrow interpretations tend to favor proponents of contested evidence whereas broad interpretations tend to favor opponents and exclusion.<sup>89</sup> Rhetorically, breadth seems easier to defend as a legal principle. As a document authored by an interdisciplinary committee of eminent scientists and other high-profile professionals, very few of whom had experience as “bench” or “line” forensic practitioners, *Strengthening* is generally interpreted as representing a very broad construction of the RSC. In one case, though, the court turned this logic on its head, arguing that to credit *Strengthening* would be to unacceptably *narrow* the RSC. Appropriating breadth as a virtue, the court “broadened” the RSC to forensic practitioners (latent print examiners in this case) whose favorable opinion of their own practice then trumped the views of the “narrow” NRC Committee composed of a few chemists, statisticians and engineers.<sup>90</sup>

#### F. STANDARD OF REVIEW AND HARMLESS ERROR

In most criminal proceedings, admissibility is governed by *Frye* or a version of FRE 702 and *Daubert*. Upon conviction, the standard for reviewing the admission of expert evidence changes. As we explained in the introduction, the question of whether expert evidence was properly admitted is reviewed by an appellate court on the basis of whether there was a mistake of law or whether the trial judge abused her discretion in admitting the evidence. Though rarer, a mistake of law is usually easier to detect because the trial judge has, for example, applied the wrong standard. Abuse of discretion is a more difficult claim to support. For, in reviewing the trial judge’s decision, the appellate court allows considerable leeway to the trial judge. Only where the trial judge is manifestly wrong or unreasonable will an appellate court intervene to find that evidence was improperly admitted.<sup>91</sup>

Review of decisions can be formalistic and remarkably insensitive to what might be thought of as substantial limitations with the relevant forensic science techniques. In *Watkins*, for example, the Sixth Circuit Court of Appeals was un-

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<sup>87</sup> United States v. Love, 2011 WL 2173644, 7 (S.D. Cal. 2011).

<sup>88</sup> *Love*, 2011 WL. See also United States v. Otero, 849 F. Supp.2d 425, 431ff (D.N.J. 2012).

<sup>89</sup> Simon A. Cole, *Out of the Daubert Fire and into the Fryeing Pan? The Admissibility of Latent Print Evidence in Frye Jurisdictions*, 9 MINN. J. L. SCI. & TECH. 453 (2008); DAVID L. FAIGMAN ET AL., SCIENCE IN THE LAW: FORENSIC SCIENCE ISSUES 294 (2002).

<sup>90</sup> Illinois v. Luna, 989 N.E.2d 655, 675 (2013).

<sup>91</sup> See General Electric Co. v. Joiner, 522 U.S. 136 (1997).

willing to find an abuse of discretion in the admission of latent fingerprint evidence, where the examiner testified that there was no error rate, in part because *Strengthening* had not been before the trial judge.<sup>92</sup>

Where a court finds that some evidence was inadmissible, or inadmissible in the form it was presented at trial, that does not end the matter. On review, the appellate court considers the significance of the error in relation to the overall case and the soundness of the conviction. In most cases this means that admissibility errors are found to be “harmless:”

In any event, we conclude any error in admitting the fingerprint evidence was harmless. The erroneous admission of scientific analysis evidence requires reversal only if it is reasonably probable the verdict would have been more favorable to the defendant in the absence of the error. ... Here, there is no reasonable probability of a different result.<sup>93</sup>

Even judges writing in dissent, against the apparent complacency of their brethren, appear constrained by overarching standards of review.<sup>94</sup>

Confidence in the original conviction affords an opportunity for appellate judges to occasionally express concerns about forensic science evidence that have few practical implications. The appellant is unsuccessful in the attempt to secure a re-trial and the legal significance of concerns, or even dissent, tend to be limited, especially where the appellate court concludes that a technique, such as latent fingerprint evidence, remains admissible as positive evidence of identity.<sup>95</sup>

#### G. GOOD-FAITH PROGRESS

Other courts did not seriously contest the conclusions in *Strengthening*, but rather found that its criticisms were blunted by the forensic science community’s efforts to reform following its release. Thus, as Cooper found, evidence of good-faith progress toward reform became the basis for admissibility or continuing admissibility:

The court recognizes that the NAS Report and other publications cited by Love critique some aspects of latent fingerprint analysis. However, the forensic science community generally and the FBI in particular have begun to take appropriate steps to respond to that criticism.<sup>96</sup>

The confidence in institutional responses was oriented toward the present (and the future) and reinforces the primacy of the specific case before the court rather than the historical legacy.

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<sup>92</sup> United States v. Watkins, 450 Fed. Appx. 511, 4 (6th Cir. 2011). See also People v. Jones, 2013 WL 5397389 (Cal. App.2 Dist. 2013).

<sup>93</sup> Jones, 2013 WL at 4.

<sup>94</sup> Minnesota v. Hull, 788 N.W.2d 91, 110 (2010).

<sup>95</sup> In re Personal Restraint of Trapp, 165 Wash. App. 1003, 1, 4-8 (2011).

<sup>96</sup> United States v. Love, 2011 WL 2173644, 8 (S.D. Cal. 2011).

H. PRIVILEGING THE CASE AND THE SPECIFIC OPINION:  
INSENSITIVITY TO GENERAL CRITICISMS

In the absence of evaluative research, and empirically-based standards and forms of expression, the experience of testifying forensic analysts was an important feature in many judgments admitting or upholding the admission of incriminating opinions. This is not surprising given that once a technique is deemed admissible—that is, has survived a *Frye* or *Daubert*-style admissibility hearing or has been admitted for a long time (i.e. “grandfathered” before *Daubert* or even *Frye*)—then subsequent admission tends to be contingent upon the analyst being trained and experienced with the otherwise admissible technique.<sup>97</sup> The value of the technique, like the experience of the analyst, is open to challenge at trial but not the admissibility of the technique or the *experienced* analyst’s opinion.

In some instances courts drew upon *Strengthening* to reinforce the importance of experience in the subjective judgments the analysts were making.

Because such determinations ‘involve subjective qualitative judgments... the accuracy of [an] examiner[’s] assessment[ ] is highly dependant on [her] skill and training.’ See... *Strengthening*...<sup>98</sup>

Most courts were satisfied with references to formal training, prior experience (not always very long or from the precise domain – see Section IV) and previous appearances in courts.<sup>99</sup>

A common response to challenges to forensic science evidence was to point to the fact that no criticism of the specific finding was raised by the defendant/apellant.

Notably, Langlois offered no contrary testimony to refute the state’s ballistic experts. Apart from a thorough cross-examination, he presented no credible challenge to the underlying theory of how marks are transferred from a firearm to the primary components of a cartridge, nor to the methodology of identifying a match between a particular gun and a shell case found at a crime scene.<sup>100</sup>

This is interesting because it reinforces the courts’ limited attention—only wanting to hear about specific problems (and actual errors) in the instant case—and tendency to implicitly accept the value of underlying techniques. Courts were largely unreceptive to general criticisms, particularly those of a methodological or statistical nature—in the absence of a viable alternative technique.<sup>101</sup> Such ap-

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<sup>97</sup> Simon A. Cole, *Grandfathering Evidence: Fingerprint Admissibility Rulings from Jennings to Llera Plaza and Back Again*, 41 AM. CRIM. L. REV. 1189 (2004).

<sup>98</sup> United States v. Smallwood, 456 Fed. Appx. 563, 566 (6th Cir. 2012).

<sup>99</sup> See, e.g., Rodriguez v. Delaware, 30 A.3d 764 (2011); North Carolina v. Adams, 212 N.C.App. 235 (2011); Molina v. Tennessee, 2011 WL 1344287 (Tenn. Crim. App. 2011); Illinois v. Robinson, 2 N.E.3d 383 (2013); United States v. Campbell, 2012 WL 2374528 (N.D. Ga. 2013).

<sup>100</sup> Ohio v. Langlois, 2 N.E.3d. 936, 950-51 (2013).

<sup>101</sup> See, e.g., The People v. Price, 2011 WL 2043957 (2011); Commonwealth v. Gambora, 457 Mass. 715, 725 (2010); United States v. Cerna, 2010 WL 3448528 (N.D. Cal. 2010).

proaches discount the potentially corrosive implications of methodological frailties and oversights.<sup>102</sup> Admission and reliance on defense counsel to identify problems trivializes the real difficulty of conveying technical problems during an adversarial proceeding. It also elides the difficulty of obtaining a credible expert who might be able to disagree on specifics (from inside the “community”), especially where the challenge is around the limits of the technique and perhaps even the foundations of the legally-recognized field.<sup>103</sup>

Once a technique had been admitted, only specific criticisms appear to be capable of seriously compromising the weight an appellate court might attribute to the admissible and implicitly reliable derivative opinion.

... the fingerprint identification method used by the police is generally accepted within the scientific community. ... Once the scientific community accepts a methodology, application of the methodology to a particular case is a matter of weight ... the reliability of fingerprint identification has been tested in our adversarial system for over a century and routinely subjected to peer review. ... Once the evidence is accepted as scientifically acceptable, the question of admissibility turns on whether the witnesses qualify as experts and whether proffered testimony would be helpful to the trier of fact.<sup>104</sup>

Focusing on case specifics privileges an individualized assessment of the experience and interpretation of the forensic analyst over “field” destabilizing criticisms around validation, reliability and standards. While focusing on specifics might make sense in relation to the case-based nature of Anglo-American dispute resolution, it seems undesirable to disregard fundamental, broadly-based methodological criticisms on the basis that the case is concerned with a specific application of a technique and a derivative opinion. Such tactics tend, however, to be rationalized through recourse to precedent, prior admission and reliance, along with the inability to identify an actual error.

### *I. THE GALILEO EFFECT: THE IMPLICATIONS OF PRIVILEGING SPECIFICS AND “FIELDS”*

In addition to disputes around the boundaries of fields, the membership of the RSC and the meaning of acceptance (see Sub-section III.E), by privileging longstanding practice and experience, the decisions reveal a number of occasions

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<sup>102</sup> See Faigman et al., *supra* note 47. We find the legal tendency to focus on individual cases and the use of techniques in relation to particular permutations of evidence in criminal proceedings curious, at the very least. We have concerns about focusing on the use of techniques in individual cases thereby requiring every defendant to identify specific errors or persuade a particular jury of the significance of fundamental methodological issues rather than have appellate courts endeavor to address and provide guidance on general problems, or problems associated with a technique or set of techniques in a systematic way.

<sup>103</sup> See Michael Lynch & Simon A. Cole, *Science and Technology Studies on Trial: Dilemmas of Expertise*, 35 SOC. STUDIES SCI. 269–311 (2005); Simon A. Cole, *A Cautionary Tale About Cautionary Tales About Intervention*, 16 ORG. 121 (2009). See also *Hinton v. Alabama*, 134 S. Ct. 1081 (2014).

<sup>104</sup> *State of Washington v. Piggott*, 2014 WL 1286564 (Wash. App. Div. 1), 2 (2014). See also *Campbell*, 2012 WL at 5-6 quoting *United States v. Stone*, 848 F. Supp.2d 714, 717-18 (2012).

where individual forensic analysts explicitly reject the findings and recommendations in *Strengthening*.<sup>105</sup> In the following extract the analyst implicitly dismissed the need for the trappings of mainstream science—i.e. validation studies, standards, error rates and so forth—because of his belief in an ability to determine whether bullets had been discharged from a particular gun based largely on experience doing precisely that.

On cross-examination, Smith acknowledged that the [NRC report] concluded that additional studies should be conducted to ‘make the process of individualization more precise and reputable.’ ... However, he disagreed with the NRC’s assessment that ‘[b]ecause not enough is known about the variabilities among individual tools and guns we are not able to specify how many points of similarity are necessary for a given level of confidence in the result...’<sup>106</sup>

Remarkably, on most occasions when an analyst stands against *Strengthening*, the court tends to allow their evidence in a manner that privileges past legal practices and the experience of the analyst. Issues identified by the NRC committee are, at best, issues for cross-examination and, perhaps, weight.<sup>107</sup>

This kind of response to the NRC report constitutes *ipse dixit*.<sup>108</sup> It represents the bare assertions or the impressions of individual (and occasionally groups of) forensic analysts, who sometimes lack formal scientific training.<sup>109</sup> In making this point, it is important to acknowledge that a large proportion of the expert reports and testimony appearing in our dataset (and beyond) do the same sort of thing, albeit implicitly. Few prosecutors and expert witnesses unilaterally advert to *Strengthening* or its implications. Any engagement tends to be responsive and critical. When the report is raised by defendants/appellants, prosecutors regularly marginalize its legal and scientific significance.

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<sup>105</sup> See, e.g., Wayne G. Plumtree, *A Perspective on the Appropriate Weight to be Given to the National Academy of Sciences' Report on Forensics in Evidentiary Hearings: The Significance of Continued Court Acceptance of Fingerprint Evidence*, 42 Sw. L. REV. 605 (2013). American forensic disciplinary organizations have varied widely in their response to *Strengthening*. Some have issued official responses that are highly respectful of the NRC and its scientific authority, while emphasizing interpretations of *Strengthening* that suit their preferences, but others have denounced the committee and its report as incompetent, primarily on the basis of its failure to include practitioners, of the various forensic disciplines discussed in the report, as members.

<sup>106</sup> *Melcher v. Holland*, 2014 WL 31359, 5-6, 11 (N.D. Cal. 2014). See also *Commonwealth v. Joyner*, 4 N.E.3d 282, 289 (2014); *Illinois v. Luna*, 989 N.E.2d 655, 663 (2013); *Commonwealth v. Wadlington*, 467 Mass. 192, 205 (2014); *Illinois v. Robinson*, 2 N.E.3d 383, 390 (2013).

<sup>107</sup> *United States v. Rose*, 672 F. Supp.2d 723, 724 (D. Md. 2009); *United States v. McCluskey*, 954 F. Supp.2d 1224, 1238 (D.N.M. 2013); *United States v. Council*, 777 F. Supp.2d 1006, 1010-11 (E.D. Va. 2011); *Pettus v. United States*, 37 A.3d 213, 228 (2012); *Stone*, 848 F. Supp.2d at 719; *New Mexico v. Jaramillo*, 272 P.3d 682, 770 (2011); *Turner v. Indiana*, 953 N.E.2d 1039, 1050, 1053 (2011).

<sup>108</sup> *Contrast General Electric Co. v. Joiner*, 522 U.S. 136, 137 (2007).

<sup>109</sup> Jennifer L Mnookin et al, *The Need for a Research Culture in the Forensic Sciences*, 58 UCLA L. REV. 725 (2011).

J. IT'S NOT A LEGAL DOCUMENT BUT IT'S NOT REALLY SCIENTIFIC EITHER

Few of the judgments were willing to countenance *Strengthening* as a document that had much to say about law or legal practice. Much more surprising, perhaps, is the apparent reluctance to recognize the report as an authoritative contribution to our understanding of the forensic sciences or as a learned treatise. "Learned treatise" is a legal term with significance because it renders a text admissible as an exception to the hearsay rule (FRE 803(18)) or allows a lawyer to use it explicitly in cross-examination.<sup>110</sup> One court denied "learned treatise" status to *Strengthening* on the basis that it was not an abuse of discretion for the judge to decline to take "judicial notice" of the report.<sup>111</sup> In so doing the court made an evaluative argument:

The relevant scientific fingerprint community does not consider the NAS Report a learned treatise. The people on the scientific working group on fingerprints, SWGFAST, do not consider it a learned treatise. The FBI at Quantico does not consider it a learned treatise. The fingerprint unit at Scotland Yard does not consider it a learned treatise. These are the leaders in the field. These are the people that are brought together to issue protocols and standards for those folks who are practicing in the field. And they don't consider it a learned treatise. What they consider it to be is a policy statement.<sup>112</sup>

Here, boundary (or field) work is used to marginalize the (non-forensic) scientists, engineers and statisticians responsible for *Strengthening*. Within our sample, this constituted the most extreme example of a court explicitly rejecting the epistemic authority of *Strengthening*. Far more common were the aforementioned tactics, where the authority of *Strengthening* was never explicitly denied, even if its implications were represented as insufficient to affect admissibility or the original outcome.

IV. TRIAL SAFEGUARDS: "VIGOROUS CROSS-EXAMINATION" AND "SHAKY" EVIDENCE

Commitment to the liberal admissibility thrust, in conjunction with the traditionally accommodating approach to the state's forensic science and medicine evidence, means that most forensic science evidence continues to be deemed admissible. Though for some testimony this now requires minor qualifications to the form of expression, such as "to a reasonable degree of ballistic certainty." Apart from a principled commitment to admitting as much relevant evidence as possible, liberal admissibility policies are grounded in longstanding confidence in the effectiveness of trial safeguards and the capabilities of jurors and judges. Trial and appellate courts routinely invoke the ability to confront witnesses, to call

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<sup>110</sup> *Gee v. United States*, 54 A.3d 1249, 1265 (2012).

<sup>111</sup> *Gee*, 54 A.3d at 1266.

<sup>112</sup> *Id.* at 1262-63, 1266. See also Simon A. Cole, *The Innocence Crisis and Forensic Science Reform in WRONGFUL CONVICTION AND CRIMINAL JUSTICE REFORM* (Marvin Zalman & Julia Carrano eds., 2014).

rebuttal witnesses and, where appropriate, for judges to offer careful guidance as the appropriate means of dealing with “shaky” expert evidence.

In the extract below, a latent fingerprint examiner is allowed to proffer opinions about tire tracks and shoeprints because of his “substantial experience” with “impression evidence.” Revealingly, this extract incorporates a quotation from the *Daubert* decision reinforcing the centrality of trial safeguards as the primary means of managing incriminating evidence while maintaining a profound optimism about the abilities of American jurors.

Hegman’s expertise in fingerprint analysis was relevant to his experience with impression evidence. While tire track and shoeprint analysis may be viewed as a distinct forensic discipline from fingerprint analysis because it involves mass-produced items, the analytic process is similar. Specifically, tire tracks, shoeprints, and fingerprints are all forms of impression evidence. ... while Hegman’s substantial experience in fingerprint analysis does not alone support his admission as an expert in other forms of impression analysis, the trial judge did not abuse his discretion in considering that experience and training as relevant. ... Finally, the defense had the opportunity to cross-examine Hegman on the stand regarding his background, experience, and methodological approach. ‘Vigorous cross examination, presentation of contrary evidence, and careful instruction on the burden of proof are the traditional and appropriate means of attacking shaky but admissible evidence.’ ... By probing Hegman on his particular experience in tire track and shoeprint analysis, defense counsel challenged his credibility before the jury and the weight to be given the impression evidence.<sup>113</sup>

Lacking information about validity and reliability, and in the midst of an adversarial proceeding, jurors are somehow expected to rationally evaluate the state’s *expert* opinion evidence. There are reasons to believe that jurors may be impressed by forensic science testimony that purports to be scientific and that defense counsel are often ill-equipped to expose and convey limitations and their significance through cross-examination.<sup>114</sup>

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<sup>113</sup> *Rodriguez v. Delaware*, 30 A.3d 764, 769-70 (2011). See also *United States v. Rose*, 672 F. Supp.2d 723, 724 (D. Md. 2009); *United States v. McCluskey*, 954 F. Supp.2d 1224, 1238 (D.N.M. 2013); *United States v. Council*, 777 F. Supp.2d 1006, 1010-11 (E.D. Va. 2011); *Pettus v. United States*, 37 A.3d 213, 228 (2012); *United States v. Stone*, 848 F. Supp.2d 714, 719 (E.D. Mich. 2012); *New Mexico v. Jaramillo*, 272 P.3d 682, 770 (2011); *Turner v. Indiana*, 953 N.E.2d 1039, 1050, 1053 (2011).

<sup>114</sup> See generally Sarah Lucy Cooper, *Judicial Responses to Challenges to Firearms Identification Evidence: A Need for New Perspectives on Finality*, 31 T.M. COOLEY L. REV. 457 (2014); Gary Edmond & Mehera San Roque, *The Cool Crucible: Forensic Science and the Frailty of the Criminal Trial*, 24 CURRENT ISSUES CRIM. JUST. 51 (2012). Though consider Gary Edmond et al., *How to Cross-Examine Forensic Scientists: A Guide for Lawyers*, 39 AUSTRALIAN BAR REV. 174 (2014).

## V. INCONCLUSIVE: *STRENGTHENING'S* DELPHIC DIMENSIONS

The issue of complex scientific evidence in legal disputes has been widely discussed as a growing problem in our increasingly technological society.<sup>115</sup> It is widely believed that courts face difficulties due to a combination of factors including the lack of scientific training for lawyers and judges, the unsettled nature of scientific knowledge, and the presentation of scientific information to those without scientific and technical competence by interested parties in an adversarial forum. The use of authoritative documents such as NRC reports offers an appealing research site because they promise the—perhaps illusory—appearance of scientific consensus and clarity. For just a moment, on a single issue, or narrow set of issues, “science” actually seeks consensus and “speaks” univocally. If courts were ever going to defer to, or *align* themselves with, “science,” one might think it would be at such moments.<sup>116</sup> Our study, however, suggests that deference requires more than (apparent) scientific consensus—at least when forensic science evidence is concerned. For, by and large, *Strengthening* has not been received as a scientific statement requiring engagement, let alone deference or alignment, by most judges. Indeed, with the recent creation of an elaborate set of scientific committees, through a joint effort of NIST and the Department of Justice, *Strengthening's* impact will probably be most conspicuous outside American courtrooms.

There is, however, little doubt that scientists can influence legal proceedings and practice, particularly through independent and authoritative consensus reports. Nonetheless, our study illustrates how courts have considerable scope for maneuver and resistance. Courts are able, and sometimes feel obliged, to mediate (even inoculate), the terms and conditions on which they engage with exogenous knowledges and their implications. In doing law, and appealing to legal practices, processes and values, courts are able to manage the terms of engagement, though always at some risk to attempts to achieve espoused goals and maintain public legitimacy.

Notwithstanding the apparent reluctance to formally embrace *Strengthening*, consensus statements and formal reports have previously assisted courts with controversial forensic science evidence.<sup>117</sup> All previous NRC reports on forensic

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<sup>115</sup> See, e.g., Learned Hand, *Historical and Practical Considerations Regarding Expert Testimony*, 15 HARV. L. REV. 40 (1901); PETER HUBER, *GALILEO'S REVENGE: JUNK SCIENCE IN THE COURTROOM* (1991); STEVEN GOLDBERG, *CULTURE CLASH: LAW AND SCIENCE IN AMERICA* (1994); Jasanoff, *supra* note 28.

<sup>116</sup> The term ‘accommodation’ might not capture some of the nuance here, where it is not always obvious that courts fully comprehend, let alone incorporate, particular claims about science. Consider Sheila Jasanoff, *Beyond Epistemology: Relativism and Engagement in the Politics of Science*, 26 SOC. STUDIES SCI. 393 (1996); Gary Edmond, *The Building Blocks of Forensic Science and Law: Recent Work on DNA Profiling (and Photo Comparison)*, 41 SOC. STUDIES SCI. 127 (2011) and Gary Edmond & David Mercer, *Conjectures and Exhumations: Citations of History, Philosophy and Sociology of Science in U.S. Federal Courts*, 14 LAW & LITERATURE 309 (2002). More generally, see GUNTHER TEUBNER, *LAW AS AN AUTOPOIETIC SYSTEM* (Anne Bankowska & Ruth Adler trans., 1993).

<sup>117</sup> ARONSON, *supra* note 32; KAYE, *supra* note 32.

science, however, have been about specific forensic techniques.<sup>118</sup> *Strengthening* stands in stark contrast to these reports. Responding to its formal mandate the Committee's approach and report were broad in their conceptualization. The report itself offers sweeping criticisms of many areas of practice and many different forensic science techniques. It is often ambivalent and ambiguous in its findings: simultaneously critical of scientific failures and oversights while recognizing the probative value of the scientifically deficient techniques. It sometimes engages in sweeping or vague exhortations, such as urging that forensic science should adopt "scientific culture," that all forensic techniques be standardized, practitioners, certified, and laboratories accredited. Furthermore, *Strengthening* does not provide guidance on whether specific techniques should continue to be used or how results should be expressed. Notwithstanding unprecedented criticisms, *Strengthening* does not purport to advise on admissibility. The report does not, for example, suggest that latent fingerprint or ballistics evidence should not be admitted. Rather, it places emphasis on the need for research, standardization, tempered expression and moderation. Though stridently critical of legal attempts to regulate forensic science evidence and undoubtedly relevant to a range of evidentiary procedures and decisions, *Strengthening* is not primarily oriented to the exigencies of legal practice. It does not, for example, advise how existing technologies should be used or restricted.

*Strengthening* can be distinguished from earlier NRC reports in both its breadth and implications. The earlier NRC reports provided recommendations that were more constrained.<sup>119</sup> They could be more readily identified, understood and acted upon. Their recommendations applied to a small set of issues or cases, although DNA profiling was in the process of rapid expansion. Conversely, many of the concerns in *Strengthening* are diffuse: applicable to a very large number of current and legacy cases. In the absence of clear guidance and in the face of daunting logistical complexity, it is perhaps not surprising that courts have been cautious in their response to a report with incredibly disruptive potential. It is far from obvious that proposed reforms are affordable, or readily achievable, in the short term. In the absence of clear advice and viable alternatives courts have relied upon legal "solutions" such as opinionization and new forms of expression as judges sought to respond to apparent epistemic problems through trial mechanisms. American judges have invoked conventional legal rules and practices, valorized adversarialism, and insisted on the need to address problems on a case-by-case basis. The emphasis on individual cases helps to insulate earlier convictions that relied upon comparison evidence.

Another reason courts found it difficult to embrace the critique underpinning *Strengthening* is that in the vast majority of criminal cases (including pleas) it is not only forensic science evidence that supports the guilt of the accused. In many cases a mix of additional admissible and sometimes inadmissible evidence (such as character or tendency evidence, admissions or prior convictions) suggest

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<sup>118</sup> For a review of reports on forensic science, see Simon A. Cole, *National Academy of Sciences (NAS) in ENCYCLOPEDIA OF FORENSIC SCIENCES* 190 (Jay A. Siegel & Pekka J. Saukko eds., 2d ed. 2013).

<sup>119</sup> NATIONAL RESEARCH COUNCIL, *THE EVALUATION OF FORENSIC DNA EVIDENCE* (1996) and NATIONAL RESEARCH COUNCIL, *DNA TECHNOLOGY IN FORENSIC SCIENCE* (1992).

that it is the accused who committed the crime or is implicated in the offence. Here, it may be that in many cases the opinions of forensic analysts using techniques that may not be as reliable as conventionally suggested, nevertheless underpin factually correct outcomes. There would seem to be pragmatic dimensions to the legal tolerance of forensic science evidence that is supported by a commitment to truth, a tradition of liberal admission, a belief in the effectiveness of trial safeguards and individual rights, along with the constitutionality of adversarial jury trials, which coincide with an underlying commitment to crime control. Many judges probably believe, perhaps correctly, that the exclusion of unvalidated forensic science techniques would make it harder to successfully prosecute guilty persons. These commitments might be particularly appealing when the alternative is recognition or adoption of a diffuse report that would disrupt criminal justice practice, place a question mark over many convictions, and unavoidably erode the legitimacy of American criminal courts. How the goal of not convicting the innocent corresponds with the proportion of innocent persons who plead or are found guilty on the basis of misleading or mistaken forensic techniques, remains unclear.<sup>120</sup>

## VI. CONCLUSIONS

In conclusion, it is useful to reflect on some of the different interpretations of *Strengthening*. It might be that the different groups embroiled in the contests around the forensic sciences have tended to produce particular kinds of (let's say biased) readings of *Strengthening* and its practical significance. Many forensic scientists, particularly those from practitioner backgrounds, tended to respond in a hostile manner, at least initially. Some of the initial responses to being labelled non-scientific seem to have been assuaged by continuing admission, along with realization that the report is a resource that can be mobilized to secure additional funding for forensic science research, training and equipment. Conversely, most scholarly commentators have tended to see *Strengthening* as vindication of (their) criticisms that were treated as marginal before the report was handed down. Among these "critics" there may be a tendency to over-read recommendations and to invoke idealized models of science and expertise when discussing forensic science evidence and legal implications. Into the contests over how to read the NRC report, prosecutors and judges have difficult professional obligations and institutional traditions to navigate. Realistically they cannot ignore the report and its implications, even if particular courts insist that some forms of legal action do not allow them to consider it overtly. Defense lawyers have struggled to translate general methodological concerns into forms of action or evidence that courts were willing to recognize and respond to. The NRC committee might have generated more controversy, even notoriety, and stimulated action if it had recommended that latent fingerprint examiners, ballistics analysts and so on, should not be allowed to match a trace to a source until their techniques are scientifi-

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<sup>120</sup> Samuel R. Gross et al., *Rate of False Conviction of Criminal Defendants Who Are Sentenced to Death*, 111 PNAS 7230 (2014); D. Michael Risinger, *Innocents Convicted: An Empirically Justified Wrongful Conviction Rate*, 97 J. CRIM. L. & CRIMINOLOGY 761 (2007).

cally-supported through rigorous validation processes. Though, such a prescriptive approach to legal concepts like admissibility might have overplayed their position and epistemic capital.

*Strengthening's* breadth, potentially disruptive implications, along with the lack of clear prescription for legal practice, all made it difficult and unappealing for courts to defer, let alone recognize the depth of problems suggested by critics, notwithstanding apparent endorsement by the NRC committee. Our study reveals how, with very few exceptions, *Strengthening* is embraced by those being prosecuted or appealing convictions. In these endeavors *Strengthening* has become a rather blunt and impotent "weapon on the weak".<sup>121</sup>

Over time, some of *Strengthening's* more critical insights are likely to trickle down to forensic science communities, bar associations and courts, and occasionally flow to the extent that committees recently assembled by NIST and NIJ impose reforms, or declare some area of forensic science, or some technique or expression, unreliable (e.g. bite mark comparison evidence).<sup>122</sup>

Perhaps the most unfortunate development in relation to forensic science evidence in recent years is not the reluctance to engage more directly with the *scientific advice* from *Strengthening*, but the apparent reluctance of trial and appellate judges to apply existing legal authority, particularly admissibility standards (e.g. the *Daubert* criteria), more aggressively.<sup>123</sup> *Frye* and, especially, *Daubert* seem to be conceived by lawyers and judges (operating in extremely hierarchical systems and traditions) as productive ways of engaging with scientific and technical forms of knowledge. Most lawyers and judges seem to believe that when it comes to the forensic sciences the current approach to admissibility standards—a relatively light touch in response to expert opinion evidence adduced by the state that effectively circumvents interest in validity and reliability—is sufficient, indeed appropriate. Demanding interpretations of *Daubert* are not applied to the state's forensic science evidence. For most prosecutors, judges, forensic analysts as well as the public at large, notwithstanding high profile wrongful convictions exposed through innocence projects, the overall rate of legal mistakes can be understood as miniscule, and used to valorize extant legal traditions and practice in support of a preference for gradual engagement and reform on a case by case basis.<sup>124</sup>

As this overview confirms, legal responses are as diverse as the terms and situations in which legal institutions engage with forensic analysts and their opinions. Predictably, institutional concerns and legal framing tend to pre-dominate use and interpretations and, short of wholesale engagement by the most senior courts, make it unlikely that there will be a radical change to the way lawyers

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<sup>121</sup> JAMES C. SCOTT, *WEAPONS OF THE WEAK: EVERYDAY FORMS OF PEASANT RESISTANCE* (1985).

<sup>122</sup> Erica Beecher-Monas, *Reality Bites: The Illusion of Science in Bite-Mark Evidence*, 30 CARDOZO L. REV. 1369 (2009).

<sup>123</sup> See, e.g., Jennifer L. Groscup et al., *The Effects of Daubert on the Admissibility of Expert Testimony in State and Federal Criminal Cases*, 8 PSYCHOL. PUB. POL'Y & L. 339 (2002); D. Michael Risinger, *Navigating Expert Reliability: Are Criminal Standards of Certainty Being Left on the Dock*, 64 ALB. L. REV. 99 (2002).

<sup>124</sup> See, e.g., Scalia J. in *Kansas v. Marsh*, 126 S. Ct. 2516 (2006).

and judges engage with forensic science evidence in criminal proceedings. The courts in our study rationalized their responses and evasions by reference to the specific case and the specific application of the technique, past practices in the jurisdiction, the responses of courts in other jurisdictions, the experience of the state's forensic scientists, the strength of the overall case (notwithstanding the treatment of the forensic science evidence at trial), and specifically enumerated rights such as the right to confront witnesses (in the Sixth Amendment). Simultaneously, they maintain a seemingly unshakeable confidence in adversarialism, trial safeguards, the party control of litigation, and the ability of lawyers, judges and juries to rationally evaluate scientific and technical evidence.<sup>125</sup> The limited resourcing available to most defendants, widespread dilatory performances by defense counsel, and research questioning the effectiveness of trial safeguards, seem to have done little to shake the criminal justice juggernaut.

In the end, there may be truth in the claim that: "there is a fundamental disconnect between the worlds of science and of law. Science is constantly evolving by testing and modifying its prior theories, knowledge, and 'truths.'"<sup>126</sup> It is our contention that attentive scientists have been more interested in subjecting forensic science and medicine to testing and refinement than lawyers and judges who have not only been remarkably insensitive to endemic problems across the forensic sciences, but simultaneously appear to be oblivious to the weakness of their own rules, practices and traditions, and their failure to provide more useful information to fact-finders about the actual value of forensic science evidence.

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<sup>125</sup> We are not necessarily proponents of non-adversarial approaches but rather attempting to draw attention to the confidence invested in adversarial practices on the basis of tradition and the personal experience of lawyers. We might note that these are systems that do not usually provide feedback and so are less than ideal for promoting learning and understanding.

<sup>126</sup> *Robbins v. Texas*, 360 S.W.3d 446, 469 (2011).