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THE NEED FOR A LENIENT ADMISSIBILITY STANDARD FOR DEFENSE FORENSIC EVIDENCE

*Myeonki Kim**

I. INTRODUCTION

The reliability of forensic evidence is crucial to the search for truth.¹ However, when DNA evidence began to reveal wrongful convictions in the 1990s, doubts about the reliability of forensic evidence increased.² The influential report, *Strengthening Forensic Science in the United States: A Path Forward*,³ published by the National Research Council (“NRC”) in 2009 (“2009 NRC Report”), confirmed most of these suspicions.⁴ The report declared that many forensic disciplines lack a sufficient scientific basis and that courts had failed to filter out problematic forensic evidence.⁵

The impacts were huge. Forensic practitioners, lawyers, and academics have taken seriously the lessons of the 2009 NRC Report. However, there is an imbalance in the efforts for change.⁶ Since 2009, demands for reform in forensic disciplines have significantly increased, and governmental support for reforms followed.⁷ In contrast, the courts remain reluctant to strictly review the reliability of forensic evidence.⁸ Although the authority of the report is widely acknowledged, it has not governed the admissibility of individual pieces of evidence. Simply put, courts have failed to rigorously monitor the quality of forensic evidence, at least when that evidence is proffered by the prosecution.

The problem is that forensic practices cannot be improved

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1. This is because expert testimony generally addresses areas beyond juror’s knowledge and therefore is very influential to lay person. *See* Fed. R. Evid. 702(a) (An expert witness may testify if his “scientific, technical, or other specialized knowledge will *help* the trier of fact to understand the evidence or to determine a fact in issue.” (emphasis added)). With the emergence of modern science, the number of cases requiring expert witnesses surged. Therefore, providing reliable and qualified expert testimony is the core of today’s trial.

2. *See infra* Part II.A.

3. COMM. ON IDENTIFYING THE NEEDS OF THE FORENSIC SCIENCES COMMUNITY, NAT’L RESEARCH COUNCIL OF THE NAT’L ACADEMIES, *STRENGTHENING FORENSIC SCIENCE IN THE UNITED STATES: A PATH FORWARD* (2009) [hereinafter 2009 NRC REPORT].

4. *See infra* note 34–43 & accompanying text.

5. *See id.*

6. *See infra* Part II.C.

7. *See infra* note 77–86 & accompanying text.

8. *See infra* note 87–89 & accompanying text.

independently from court policy.⁹ Another important report that was recently published by the President's Council of Advisors on Science and Technology (“2016 PCAST Report”) indicated that after 2009, only a few empirical studies had been conducted to measure the accuracy of forensic method.¹⁰ Therefore, if the courts are not strict in excluding unreliable forensic evidence, practices will remain the same, with little incentive to change.¹¹ Although the courts have made some efforts to strengthen defendant’s constitutional rights, they have not been enough.¹²

This article argues that, given this landscape, a new approach to admissibility of forensic evidence is required to level the playing field and create incentives for improving the reliability of forensic evidence.¹³ Perhaps counter-intuitively, this article argues that the most effective way to respond to the deficiencies in the forensic sciences and the lax admissibility of forensic science evidence is to lower the admissibility standard of forensic evidence (under the *Daubert v. Merrell Dow Pharmaceutical, Inc.* standard) for defendants, on the condition that the evidence they are proffering is related to the prosecution’s evidence.¹⁴ It analyzes the impact of the 2009 NRC Report and the court’s on-going reluctance to exclude government forensic evidence, and explains why an asymmetric standard is necessary.¹⁵ If it is difficult for courts to strictly apply the *Daubert* standard to the prosecution, then it is fair to also apply a lenient standard to the defense. It would allow defendants to present their own stories and to rebut prosecution experts more effectively. Given the limited impact of the 2009 NRC Report and the limitations of internal reform, perhaps the only way to rigorously test the reliability of forensic evidence is to allow extensive attacks on the evidence in the courtrooms. This change will also help realize the proposals in 2016 PCAST report.¹⁶

It might be argued that a lowered standard would cause (1) the introduction of junk science; and (2) juror confusion and inconsistent verdicts. These are reasonable concerns. Therefore, this article

9. *See infra* Part III.A.

10. PRESIDENT’S COUNCIL OF ADVISORS ON SCI & TECH., FORENSIC SCIENCE IN CRIMINAL COURTS ENSURING VALIDITY OF FEATURE-COMPARISON METHODS at 7–14 (Sept. 2016) [hereinafter 2016 PCAST REPORT], http://www.whitehouse.gov/sites/default/files/microsites/ostp/PCAST/pcast_forensic_science_report_final.pdf.

11. *See infra* note 111–12 & accompanying text.

12. *See infra* Part III.B.

13. *See infra* Part IV.A.

14. *Id.*

15. *See infra* note 92–107 & accompanying text.

16. 2016 PCAST REPORT, *supra* note 10, at 14–20.

presents specific examples and cases in which it is appropriate to lower the standard for admissibility.¹⁷ This article also contends that concerns about juror confusion and inconsistent results are exaggerated.¹⁸

There are legal grounds for granting defendants a more lenient standard than the prosecution: the defendant enjoys constitutionally guaranteed rights to present favorable evidence.¹⁹ In addition, this article's proposal will contribute to weighing the expert testimony in the court, in a more scientific way. Science—at least science used in the courtroom—could be developed and strengthened through adversarial testing.²⁰ Thus, the prosecution's forensic evidence is expected to be made stronger and more reliable by confronting conflicting evidence.²¹

Part II analyzes the recent discussions about forensic science, focusing on increased doubts following the 2009 NRC Report and recent efforts for reform. Part III reveals that the courts are still reluctant to examine the reliability of forensic evidence when proffered by the prosecution, and points out that reform is limited without strong judicial enforcement. Part IV argues the need to apply the *Daubert* standard leniently for defendants, both as a means of leveling the playing field and as a way to improve forensic evidence in general. Specific methods will be provided for analyzing the qualification of experts and the relevance and validity of forensic evidence.

II. RECENT DISCUSSIONS AND CHANGES IN FORENSIC SCIENCE

A. Forensic Science and Wrongful Convictions

For decades, there have been growing concerns about the reliability of forensic science, mostly from academics.²² Starting in the early 1990s, with the emergence of the Innocence Movement, many scholars began in earnest to warn about the doubtful accuracy

17. See *infra* Part IV.B.

18. See *infra* Part IV.C.

19. See *infra* note 173–75 & accompanying text.

20. See *infra* note 162–66 & accompanying text.

21. See *infra* note 157–61 & accompanying text.

22. D. Michael Risinger, *The NAS/NRC Report on Forensic Science: A Path Forward Fraught With Pitfalls*, 2010 UTAH L. REV. 225, 225 (“For several decades now, many from the academy and some from forensic science itself have pointed to weaknesses both in various forensic fields and in the structure of forensic science practice itself—weaknesses that raised the specter of a forensic science that sometimes made unwarranted claims and that could in practice sometimes aid in the conviction of the innocent.”).

of many forensic fields, even labeling some “junk science.”²³ However, these efforts received scant attention. Even though some flawed forensic science was proven to contribute to wrongful convictions, it was generally regarded as merely the bad luck of the convicted.²⁴ And as Professor Michael Risinger indicated, “[these problems] were generally dismissed without much examination by the bulk of the forensic science establishment, and the proponents of those claims were dismissed as well.”²⁵ More seriously, many criminal justice officials, and portions of the general public, were reluctant to believe that exonerees were actually innocent.²⁶ Thus, after experiencing these tragedies, exonerees were not treated fairly and compensation remained absurdly low.²⁷

However, the status quo in forensic science was significantly changed by the development of DNA technology.²⁸ First, DNA testing, which disproved findings in some of the other forensic disciplines, confirmed nascent suspicions about many forensic sciences.²⁹ Because of its concrete scientific basis, exonerations by DNA testing almost always included proof of actual innocence. During the two decades following the first exoneration in 1989, 156 wrongfully convicted persons were freed after DNA testing, and 82

23. Paul C. Giannelli, *Junk Science: The Criminal Cases*, 84 J. CRIM. L. & CRIMINOLOGY 105 (1993) (urging a greater junk science discussion in criminal prosecution).

24. Lucian E. Dervan et al., *Voices on Innocence*, 68 FLA. L. REV. (forthcoming 2016), https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2747604 (claiming that before the DNA era, “[wrongful convictions] were either ignored or treated as individual tragedies, one-offs, rather than as illustrative of a criminal justice system that was structurally and persistently prone to factual error”).

25. Risinger, *supra* note 22, at 225.

26. One of the most infamous resistances to believe the actual innocence of exonerees is the co-accusation theory of the prosecutor in Texas. See Keith A. Findley, *Defining Innocence*, 74 ALB. L. REV. 1157, 1181 (2010) (“In Texas, after Roy Criner was convicted of a 1986 rape and murder of a young girl, post-conviction DNA testing on semen from the victim’s body excluded Criner. Nonetheless, prosecutors resisted Criner’s claim of innocence and convinced the Texas Court of Criminal Appeals that the DNA evidence was insufficient to prove innocence because Criner could have been wearing a condom, failed to ejaculate, or the semen could have been from a prior consensual sexual encounter—although those theories had never been presented in the case previously.”) (citation omitted).

27. John Shaw, *Exoneration and the Road to Compensation: The Tim Cole Act and Comprehensive Compensation for Persons Wrongfully Imprisoned*, 17 TEX. WESLEYAN L. REV. 593 (2011) (discussing insufficient compensation for exonerees and proposing a reform model similar with Texas case).

28. Dervan et al., *supra* note 24, at 7 (noting that “[t]he DNA exoneration cases in the 1990s and 2000s, of course, changed everything”).

29. As of now, among 349 DNA exoneration cases, 46% cases were found to involve the misapplication of forensic science. See INNOCENCE PROJECT, <http://www.innocenceproject.org/dna-exonerations-in-the-united-states/> (last visited Mar. 1, 2017). If one includes cases without DNA testing, 467 of 1976 wrongful convictions were attributable to problematic forensic science. See THE NAT’L REGISTRY OF EXONERATIONS <http://www.law.umich.edu/special/exoneration/Pages/ExonerationsContribFactorsByCrime.aspx> (last visited Mar. 1, 2017).

of those cases involved flawed forensic evidence.³⁰ It became unacceptable to tolerate fallible forensic science and many legal professionals, especially academics, increasingly recognized the need for a scientific basis for forensic evidence.³¹ Unlike DNA evidence, most traditional forensic evidence did not have a sufficient scientific ground.³² When it came to forensic testimony, most actors in the criminal justice system had long assumed that forensic scientists' field experience and training background would guarantee reliability.³³ The comparatively rich scientific features of DNA evidence, however, revealed the weak scientific basis of other forensic evidence. Nonetheless, despite this awareness, significant change in forensic fields has not happened.

Most would agree that 2009 was the watershed moment in forensic science communities.³⁴ When publishing the 2009 NRC Report, the NRC severely criticized current forensic science practices and confirmed many growing concerns.³⁵ Particularly shocking to the relevant communities was the harsh criticism in the report of forensic methodology.³⁶ The NRC wrote:

With the exception of nuclear DNA analysis, however, *no forensic method* has been rigorously shown to have the capacity to consistently, and with a high degree of certainty, demonstrate a connection between evidence and a specific individual or source.³⁷

This meant that even fingerprint technology, which had long been

30. This data comes from one empirical study conducted in 2009. See Brandon L. Garret & Peter J. Neufeld, *Invalid Forensic Science Testimony and Wrongful Convictions*, 95 VA. L. REV. 1, 9 (2009). Here, the data of these two decades is given here because this section reviews changes before and after the 2009 NRC Report.

31. See, e.g., Michael J. Saks & David L. Faigman, *Failed Forensics: How forensic Science Lost Its Way and How It Might Yet Find It*, 4 ANN. REV. LAW SOC. SCI. 149 (2008).

32. See *infra* note 51–65 & accompanying text.

33. Jennifer L. Mnookin, et al., *The Need for a Research Culture in the Forensic Sciences*, 58 UCLA L. REV. 725, 745 (2011) (“In court, forensic analysts asked about the bases for their claims frequently refer to experience and training rather than providing any systematic data. Experience is a legitimate basis for certain kinds of knowledge, but it is deeply problematic for experience alone to be the basis for sweeping claims like individualization. Moreover, without robust feedback mechanisms to detect and provide information about any possible mistake, experience cannot be a sound warrant for reaching valid conclusions.”) (citation omitted).

34. See, e.g., Mnookin, et al., *supra* note 33, at 729; D. Michael Risinger, *The NAS/NRC Report on Forensic Science: A Path Forward Fraught With Pitfalls*, 2010 UTAH L. REV. 225, 225–26; William C. Thompson, *The National Research Council’s Plan to Strengthen Forensic Science: Does the Path Forward Run through the Courts*, 55 JURIMETRICS 35, 35–36 (2009).

35. 2009 NRC REPORT, *supra* note 3.

36. See, e.g., Paul C. Giannelli et al., *Reference Guide on Forensic Identification Expertise*, in REFERENCE MANUAL ON SCIENTIFIC EVIDENCE 55, 71, n.91 (Federal Judicial Ctr. ed., 3d ed., 2011).

37. 2009 NRC REPORT, *supra* note 3, at 7 (emphasis added).

considered the gold standard for evidence, could also be fallible.³⁸

In its groundbreaking report, the NRC comprehensively reviewed the principal forensic science disciplines (mostly involving trace evidence) and noted the strengths and weaknesses of each forensic field.³⁹ The report also critically analyzed the admissibility of forensic science.⁴⁰ The NRC then listed suggestions for improving reliability and strengthening oversight of forensic science.⁴¹ As a way to implement these reforms, the NRC ambitiously suggested creation of “an independent federal entity, the National Institute of Forensic Science (“NIFS”).”⁴² The NRC believed that a new, independent federal agency was necessary because existing forensic agencies in the United State are too fragmented and no existing federal agency possessed the requisite expertise and independence.⁴³

The report’s recommendations generated huge political debates.⁴⁴ In addition, many criminal justice professionals were antagonistic to the report.⁴⁵ It seemed that only a small number of scholars, with minimal political power to realize change, were satisfied with the report. Thus, big changes have not yet occurred. Instead of the creation of new federal entity, a new forensics organization, in 2013, National Commission on Forensic Science (“NCFS”),⁴⁶ was established through the cooperation of the Department of Justice (“DOJ”) and the National Institute of Standards and Technology (“NIST”).⁴⁷ With the new organization, reforms on forensic science are now on-going, although they are not as comprehensive as the 2009 NRC Report envisioned.

38. The most frequently cited case to support this claim might be the FBI’s infamous misidentification in the Madrid bombing attack. See Robert B. Stacey, *A Report on the Erroneous Fingerprint Individualization in the Madrid Train Bombing Case*, 54 J. FORENSIC IDENTIFICATION 706, 706 (2004).

39. 2009 NRC REPORT, *supra* note 3, Part V.

40. *Id.* at Part III.

41. *Id.* at Part VI, VII, VIII.

42. *Id.* at 19.

43. *Id.* at 14–18.

44. Risinger, *supra* note 22, at 238, 239 (discussing the conflict between Republicans and Democrats in Congress).

45. *Id.* at 237, 239.

46. See Press Release, *U.S. Departments of Justice and Commerce Name Experts to First-ever National Commission on Forensic Science*, U.S. DEP’T OF JUSTICE, (Jan. 2014), <http://www.justice.gov/opa/pr/2014/January/14-at-029.html>.

47. Simon Cole & Gary Edmond, *Science without Precedent: The Impact of the National Research Council Report on the Admissibility and Use of Forensic Science Evidence in the United States*, 4 BRIT. J. AM. LEGAL STUD. 585, 613 (2015).

B. Why Forensic Science Had Remained Outdated and Yet Admissible in Court

One may wonder why forensic science has remained so outdated, even into the early 21st century. Given the remarkable development of modern science, this lag in forensic science seems strange. One may also wonder why the judicial system has consistently failed to exclude flawed forensic evidence. If judges had scrupulously reviewed the reliability of forensic evidence, they might have prevented a significant number of wrongful convictions involving problematic forensic science.

These points are particularly distinguishable from the development of DNA evidence and jurisprudence regarding its admissibility. Immediately after the advent of DNA technology, academics, forensic science communities, and judiciaries endeavored to achieve a high degree of certainty. Long before the 2009 NRC Report, the NRC demonstrated a high level of interest in DNA, publishing two reports in 1992 and 1996.⁴⁸ The courts were also careful about admitting DNA evidence because of its powerful influence on fact-finders.⁴⁹ Because of these efforts, most relevant professionals now accept DNA evidence as the most reliable scientific evidence. It is this high confidence in DNA evidence that has produced hundreds of exonerations.⁵⁰ Recognizing this short history of DNA evidence helps one understand two distinct characteristics found in other types of forensic evidence.

First, many forensic disciplines lack important features normally found in scientific fields. These features are well explained in the 2009 NRC Report. The report noted that the scientific method involves a series of systematic steps to accumulate data; continuous observation, testing, and modification; methods to reduce errors and bias; ultimate explanations of broad scientific principles; and so on.⁵¹ The report also listed key elements of good scientific practice when creating new scientific theories.⁵² These elements include “precision when defining terms, processes, context, results, and limitations;

48. See NAT’L RESEARCH COUNCIL, DNA TECHNOLOGY IN FORENSIC SCIENCE (1992); NAT’L RESEARCH COUNCIL, THE EVALUATION OF FORENSIC DNA EVIDENCE (1996).

49. Thompson, *supra* note 34, at 41-44 (explaining the courts’ careful approach in admitting DNA evidence in the 1980s and 1990s).

50. But some criticize about blind faith in DNA evidence. See ERIN MURPHY, INSIDE THE CELL: THE DARK SIDE OF FORENSIC DNA at xi (2015) (“Generally speaking, [the] enthusiasm for DNA typing is not misguided, and it is not wrong. DNA typing *is* a marked advance over more primitive forensic method. It *does* rely on scientifically established principles and mathematically sound statistics. . . . But revolutionary does not mean infallible, and better does not mean faultless.”).

51. 2009 NRC REPORT, *supra* note 3, at 112.

52. *Id.*

openness to new ideas, including criticism and refutation; and protections against bias and overstatement (going beyond the facts).”⁵³ The report said that these principles for creating new scientific knowledge could also be applied to the strengthening of forensic science.⁵⁴ These characteristics, which would make forensic science more scientific, are rarely found in forensic disciplines.

This is because, historically, forensic science has been developed and followed by forensic practitioners in police laboratories, rather than by scientists in research institutions where most scientific studies are conducted. Professor Jennifer L. Mnookin observed that forensic scientists generally rely on “experience and training rather than providing any systematic data” for “the bases [of] their claims.”⁵⁵ Also, forensic communities are “willing to infer scientific validity from the fact of longstanding use.”⁵⁶ These practices are far from the normal scientific methods described above. Mnookin noted that, “without robust feedback mechanisms to detect and provide information about any possible mistake, experience cannot be a sound warrant for reaching valid conclusions.”⁵⁷ “Convictions,” she emphasized, “do not necessarily establish the accuracy of the evidence undergirding them.”⁵⁸ Thus, beyond anecdotal casework,⁵⁹

53. *Id.* at 113.

54. *Id.* The report noted that:

In day-to-day forensic science work, the process of formulating and testing hypotheses is replaced with the careful preparation and analysis of samples and the interpretation of results. But that applied work, if done well, still exhibits the same hallmarks of basic science: the use of validated methods and care in following their protocols; the development of careful and adequate documentation; the avoidance of biases; and interpretation conducted within the constraints of what the science will allow.

Id.

55. Mnookin, et al., *supra* note 33, at 745.

56. *Id.* at 747.

57. *Id.* at 745.

58. *Id.* at 748 (“[T]he very fact that many kinds of pattern evidence are believed to be especially powerful and persuasive proof makes inferring validity from its success dangerous. If a fingerprint error leads to a misidentification, might the identified individual nonetheless be convicted, or even plead guilty to avoid a stronger sanction at trial, in the face of evidence that seems virtually indisputable?”).

59. Mnookin carefully differentiates mere anecdotal caseworks from research. *Id.* at 749. She notes that:

In addition, a research culture would realize that casework is not research. To be sure, researchers may introduce research questions into the stream of what looks to an analyst like ordinary casework. Covert research of this sort can provide some of the most ecologically valid data about actual practices. Research could also entail examining casework in a structured manner. But an analyst engaged in ordinary casework is not herself conducting research. Casework may suggest research problems worth exploring. It may lead to hypotheses worth developing.

she argues forensic science disciplines need realistic and plausible research plans.⁶⁰

Second, rarely have the courts been concerned about the reliability of forensic evidence, even after the emergence of the *Daubert* trilogy, which established the comprehensive evidentiary standard for expert testimony.⁶¹ The *Daubert* trilogy commands trial judges to scrutinize the reliability of all expert testimony.⁶² On its surface, the *Daubert* trilogy seemed to apply to all cases, whether civil or criminal.⁶³ Thus, criminal scholars wondered how this new standard would affect forensic evidence in criminal cases.⁶⁴ If applied properly, it was expected to exclude most forensic evidence because of its weak

Unusual case findings may be worth discussing at professional meetings or publishing as food for thought. Indeed, the International Association of Identification (IAI) routinely publishes such materials in its journal, and they may provide useful platforms for discussion and expand the experiential basis available to practitioners. But case findings ought not to be mistaken for structured research or empirical data that goes beyond the anecdotal, whether or not such findings are published. Unlike planned research, casework does not permit the development of careful controls, defined independent variables, or structured and directed focus. Also, and critically, in casework, ground truth is not known and cannot simply be inferred by a conviction, a confession, or the consensus judgment of experts.

Id. at 749 (citation omitted).

60. *Id.* 749–50 (“We do not mean to set up an unrealistically idealized vision of real research. Legitimate research can vary in its degree of formality and ecological validity. . . . But research does, and must, involve explicit study design. And research reports and publications, comporting with the research culture value of transparency, must be as explicit as is feasible about the nature of the study design.”).

61. They are (1) *Daubert v. Merrell Dow Pharmaceutical, Inc.*, 509 U.S. 579 (1993), (2) *General Electric Co. v. Joiner*, 522 U.S. 137 (1997), and (3) *Kumho Tire Company, Ltd. v. Carmichael* 526 U.S. 136 (1999).

62. During the last half of the 20th century, as both the amount and importance of scientific evidence increased, concerns over problematic scientific evidence and expert witnesses grew. The *Daubert* trilogy addressed these problems. In 1993, the Court delivered a landmark decision, *Daubert*, 509 U.S. at 579, which ambitiously established a new admissibility standard for scientific evidence. *Daubert* substitutes the “general acceptance” standard from *Frye v. United States*, 293 F. 1013 (D.C. Cir. 1923), which had been the most commonly used standard for nearly 70 years. In *Daubert*, the Court emphasized the judge’s “gatekeeping role” to ensure the reliability of scientific evidence. *Daubert* suggested four non-exclusive factors for judges to consider when determining the reliability of scientific evidence. In a subsequent decision, the Court articulated the appellate court’s review standard for a trial court’s admission decision. *Joiner*, 522 U.S. at 136. Finally, the Court expanded the scope *Daubert*’s application and allowed judges to flexibly apply the *Daubert* standard. *Kumho*, 526 U.S. at 137. *Kumho* held that expert testimony regarding technology and experience is also subject to the *Daubert* standard. *Id.*

63. However, it is worth noting the fact patterns of the *Daubert* trilogy of cases. They all addressed scientific causation and involved huge monetary damages.

64. Peter J. Neufeld, *The (Near) Irrelevance of Daubert to Criminal Justice and Some Suggestions for Reform*, 95 AM. J. PUB. HEALTH S107, S109 (2005) (“Many thought *Daubert* would be the meaningful standard that was lacking in criminal cases and that it would serve to protect innocent defendants.”).

scientific basis. It is now well documented, however, that the *Daubert* trilogy is less relevant in criminal cases than in civil cases. Research shows that *Daubert* challenges are not widely litigated, and are even less frequently successful, in criminal cases when compared to civil cases.⁶⁵ Thus, most forensic evidence easily passes *Daubert* muster.

As Professor Paul C. Giannelli has noted, the reason the *Daubert* trilogy does not rigorously apply to criminal cases is “not clear.”⁶⁶ Commentators suggest several plausible reasons. Some point out the fundamental weakness of the defendant in the adversarial system.⁶⁷ They also note the resource inequality between the prosecution and the defense, and discovery rules that are disadvantageous to defendants, as possible significant factors.⁶⁸ Others claim that courts are just afraid of letting guilty people go free. Courts have been relying on these forensic sciences for so long it seems inconceivable to many that they might be inadmissible for want of scientific reliability. Thus, judges tend to readily admit forensic evidence by relying on precedent, rather than doing a rigorous inquiry into the reliability.⁶⁹

Professor Christopher Slobogin provides a novel perspective.⁷⁰ He

65. *See id.* at S113 (“Rules of admissibility promulgated by courts and legislatures do not function well in a criminal justice system devoid of effective defense for indigent defendants.”).

66. Paul C. Giannelli, *Daubert and Criminal Prosecutions*, 26 CRIM. JUST. 61, 63 (2011) (“The reasons for this state of affairs are not clear. Funding is no doubt part of the problem. Perhaps, judicial inertia also plays a part.”).

67. *See, e.g.*, Neufeld, *supra* note 64, at S110 (“Most criminal defendants are indigent. They are represented by public defenders, contract defenders, and private lawyers paid minimal fees by the government. In most states, before an assigned counsel can retain an expert to educate him or her, review the opposing expert’s data or conduct independent testing, counsel must secure approval from the presiding judge, an elected county official. The money to pay for the expert comes from a strained county treasury, and judges are reluctant to authorize expenditures for experts.”); Keith A. Findley, *Innocents at Risk: Adversary Imbalance, Forensic Science, and the Search for Truth*, 38 SETON HALL L. REV. 893, 929–32 (2008).

68. *See, e.g.*, Neufeld, *supra* note 64, at S110 (“The discovery available by statute and case law to a defendant who is sued for money greatly exceeds the discovery available for a defendant facing execution. In Texas, the state that leads the nation in executions, a criminal defendant is not by statute entitled to see before trial the laboratory bench notes for tests conducted on the case evidence. All that he gets is a conclusory report without the underlying notes. In Virginia, the state that is second to Texas in executions, the state’s highest court has explicitly held that a defendant facing execution is prohibited from reviewing the bench notes of the state forensic scientist who will be providing the most inculpatory evidence at trial.”) (citation omitted); Findley, *supra* note 67, at 929–32.

69. *See* Findley, *supra* note 67, 950 (“Another consequence of leaving admissibility questions to the adversary adjudicative process is that stare decisis can quickly become a substitute for analysis, and can freeze judgments about science even if the science itself continues to evolve. To the extent that stare decisis minimizes the need for repeated, case-by-case determination, it can do so in the wrong way—by locking in misjudgments about science, and preventing fluid adaptation of admissibility or other legal standards to reflect changing scientific knowledge.”).

70. Christopher Slobogin, *The Structure of Expertise in Criminal Cases*, 34 SETON HALL L. REV.

focuses on the different types of evidence that are usually introduced by the prosecution and by the defense.⁷¹ He argues that the *Daubert* factors⁷² are more amenable to the admission of “trace” evidence, which is usually introduced by the prosecution.⁷³ In contrast, psychological testimony, as “softer” social science evidence, which is frequently introduced by the defense, is inherently difficult to establish under the *Daubert* factors.⁷⁴ Thus, Slobogin notes that “the move toward the scientific way of seeing the world is much better for prosecutors than for criminal defendants.”⁷⁵ Perhaps, this analysis in part explains the unequal application of the *Daubert* trilogy to criminal cases.

In sum, forensic science has been formed and developed by forensic practitioners, instead of scientific research institutions. Therefore, despite its long history and utilization, the scientific basis has been relatively weak. Nevertheless, the courts have not appropriately excluded this evidence, for a variety of social and structural reasons. Because of these forces, forensic evidence has maintained its weak scientific quality even into the 21st century.

C. Focus on Recent Changes

After the 2009 NRC report was published, this state of affairs could no longer be ignored. Both problems are widely recognized: (1) the scientific basis for forensic evidence is too weak, and (2) the courts do not properly vet the reliability of forensic evidence. However, recent focus in this area is rather disproportional. Most reform efforts focus on strengthening individual forensic science disciplines, while discussion about the admissibility of forensic evidence is minimal.⁷⁶

First, there have been changes in the forensic disciplines. The 2009 NRC Report had a huge impact on forensic practices; many forensic practitioners take the report seriously. Collaborations have

105 (2003).

71. *Id.* at 108–23.

72. They are testability, error rate, the existence of standards, peer review and publication, and general acceptance. *See Daubert v. Merrell Dow Pharmaceutical, Inc.*, 509 U.S. 579 (1993).

73. Slobogin, *supra* note 70, at 108–18.

74. *Id.*

75. *Id.* at 108.

76. *See, e.g.*, Sarah Lucy Cooper, *The Collision of Law and Science: American Court Responses to Developments in Forensic Science*, 33 PACE L. REV. 234, 301 (2013); 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 (2014); Cole & Edmond, *supra* note 47.

increased among forensic scientists to establish best practices.⁷⁷ With greater funding, more research has been conducted.⁷⁸ Accreditations for forensic labs and certifications for forensic scientists have also been strengthened.⁷⁹ Although the initial, ambitious recommendation to establish a new federal institution was not realized, stronger ties between forensic communities and academic institutions were established.⁸⁰

This is not to say that current efforts are sufficient for reforming and strengthening forensic science. The 2016 PCAST Report revealed this point.⁸¹ After reviewing more than 2,000 forensic papers, the report found that many of the forensic feature-comparison methods still lack sufficient empirical evidence to evaluate their reliability under the Federal Rules of Evidence.⁸² Some scholars also point out the insufficiency of forensic administrative reforms. For instance, systematic audit processes of forensic labs are rare⁸³ and the efforts to measure the error rate of each forensic discipline are scant.⁸⁴ Problems with fragmented forensic laboratories and administrative affiliations are not yet resolved.⁸⁵ Nevertheless, forensic communities are receiving unprecedented attention, both in terms of quality and quantity. Especially, since the 2016 PCAST

77. COMM. ON STRENGTHENING FORENSIC SCIENCE AT THE NAT'L INSTITUTE OF JUSTICE, THE NAT'L ACADEMIES, IMPROVING THE SCIENTIFIC ROLE OF THE NATIONAL INSTITUTE OF JUSTICE 6–9 (2015) [hereinafter THE SCIENTIFIC ROLE OF THE NIJ].

78. *Id.* at 1–3, 5–6.

79. *Id.* at 3, 7.

80. *Id.*

81. See 2016 PCAST Report, *supra* note 10, at 1–14.

82. *Id.* at 1–2, 7–14 (noting that in bitemark analysis, footwear analysis, and microscopic hair comparison, there is no empirical studies to support the scientific validity and reliability of the methods, and there is only one empirical study in firearms analysis).

83. See Mnookin, et al., *supra* note 33, 746 n.49 (“[A]lthough the American Society of Crime Laboratory Directors Laboratory Accreditation Board (ASCLD-LAB) does audit some cases as part of its accreditation process, this review takes place only once every five years, and cases reviewed are not selected at random.”).

84. Jonathan J. Koehler, *Forensics or Fauxrensic? Ascertaining Accuracy in the Forensic Sciences*, 49 ARIZ. ST. L. J. 1369, 1397 (2017) (“Studies to measure error and error rates will not be treated as part of the profession’s basic research agenda.”).

85. See Risinger, *supra* note 22, at 237 (“Laboratories have been intertwined with police organizations for too long to have the police organizations surrender control over them willingly. First, just on a level of pure bureaucratic power, organizations do not easily agree to give up significant centers of budget allocation, if for no other reason than that the bigger your budget is the more important and powerful you are. In addition, there is the natural fear that the new arrangements will change the relationship and the product in ways that law enforcement will not like—it may become less predictably supportive of the desires of law enforcement to have particular outcomes ratified. Whatever the reasons—so far as I have been able to determine—few speaking for law enforcement agencies, prosecutorial agencies, forensic science organizations, or forensic science publications have supported either independence or the establishment of NIFS, and most that have spoken have opposed both.”) (citation omitted).

Report provided a comprehensive (and accurate⁸⁶) status quo of empirical evidence in each forensic discipline along with the clear criteria for the reliability, further changes are highly expected.

In contrast, less attention is paid to the role of the courts with respect to forensic science. This is partly because there seems to be a broad consensus that the adversarial system is inadequate to filter out flawed forensic evidence. The 2009 NRC Report touched upon this point.⁸⁷ It said that “[t]he adversarial process relating to the admission and exclusion of scientific evidence is not suited to the task of finding scientific truth.”⁸⁸ The report articulated that several reasons, such as “the rules governing the admissibility of forensic evidence,” “the limitations of the adversary process,” and “the common lack of scientific expertise among judges and lawyers[,]” contribute to the courts’ ineffectiveness in dealing with forensic evidence.⁸⁹ Because of the recognition of the adversarial system’s limitations, discussion of forensic evidence’s admissibility has been relatively scant.

It might not be necessary to give an equal effort to both problems. However, the present indifference to the admissibility issue should be noted. It is true that the 2009 NRC Report primarily emphasized “a tremendous need for the forensic science community to improve[,]” while it merely assumed that judicial control was unsuitable for handling forensic evidence.⁹⁰ But it is an exaggeration to frame the report as abandoning the importance of the judiciary. The report explains that “[j]udicial review, *by itself*, will not cure the infirmities of the forensic community.”⁹¹ It is still necessary to establish the appropriate role of the courts. With this in mind, the next part of this article critically reviews the recent efforts of the courts.

86. On the same day that the 2016 PCAST Report published, the Department of Justice (“DOJ”) noted that PCAST omitted to review numerous existing published studies, which support for the validity of each forensic evidence. But DOJ ultimately concluded that there are no additional studies for PCAST to review. *See* PRESIDENT’S COUNCIL OF ADVISORS ON SCI & TECH., AN ADDENDUM TO THE PCAST REPORT ON FORENSIC SCIENCE IN CRIMINAL COURTS (Jan. 2017) [hereinafter 2017 PCAST ADDENDUM], https://obamawhitehouse.archives.gov/sites/default/files/microsites/ostp/PCAST/pcast_forensics_addendum_finalv2.pdf

87. 2009 NRC REPORT, *supra* note 3, at 12.

88. *Id.*

89. *Id.* at 53. Moreover, many legal professionals consider that the impact of 2009 NRC Report on legal practice should be limited. *See* Cole & Edmond, *supra* note 47, at 602 (“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).”).

90. 2009 NRC REPORT, *supra* note 3, at 12.

91. *Id.*

III. PROBLEMS WITH THE COURT'S APPROACH

A. The Problem with Limited Court Review

It may be premature to assess the total reform efforts made by forensic communities and courts. Because the 2009 NRC Report was published only nine years ago, reforms are still in progress. However, considering the exponential interest the report generated, nine years is not that short a time. Indeed, in that time a number of empirical studies have been conducted to review the changes made in response to the report. In this section, the article first analyzes the recent changes made by the courts, and then explores how the report has affected the practices of forensic disciplines.

First, empirical research shows that the courts' efforts in scrutinizing the reliability of forensic evidence are still minimal.⁹² Changes in legal practice made as a result of the 2009 NRC Report are much fewer than was expected.⁹³

Professors Simon A. Cole and Gary Edmond conducted the most recent and comprehensive study. Cole and Edmond studied the 2009 NRC Report's direct effect on admissibility decisions in state and federal cases.⁹⁴ They compiled cases citing the 2009 NRC Report, and found 82 cases decided between 2009 and 2014.⁹⁵ After reviewing these cases, they found two situations where defendants were successful in challenging the prosecution's forensic evidence.⁹⁶ The first situation was in cases that used a presumptive drug test.⁹⁷ Presumptive testing was regarded as a less reliable method for analyzing unknown substances than gas chromatography-mass spectrometry ("GC-MS") analysis.⁹⁸ Thus, Cole and Edmond found that "[w]hen unequivocally reliable methods exist, courts seem

92. See, e.g., Cooper, *supra* note 76, at 301 ("[T]o date, the [NRC] Report has not led any court to conclude that evidence from any of these four disciplines is inadmissible."); Epstein, *supra* note 76, at 101 ("[C]ourts have overwhelmingly declined to revisit admissibility determinations or circumscribe the proposed testimony in pattern and impression evidence cases."); Cole & Edmond, *supra* note 47, at 585.

93. See Cole & Edmond, *supra* note 47, at 613–15.

94. *Id.* at 585.

95. *Id.* at 592–94.

96. *Id.* at 598–601. Defendants were also successful with confrontation right challenges. *Id.* However, because this paragraph discusses the reliability of forensic science, the confrontation right will be discussed in the next section.

97. *Id.* at 599–600 (citing *North Carolina v. Ward*, 694 S.E.2d 738 (2010); *Connecticut v. Martinez*, 69 A.3d 975 (2013)).

98. *Id.* at 599; 2009 NRC REPORT, *supra* note 3, at 135. In this test, "chromatography separates the drug from any diluents or excipients, and then mass spectrometry is used to identify the drug." 2009 NRC REPORT, *supra* note 3, at 135.

unwilling to condone the use of *insufficiently* reliable methods.”⁹⁹ The second situation was when “the change is in the way the expert’s conclusion was expressed rather than exclusion.”¹⁰⁰ Experts in those cases were required to “make clear that the evidence they are proffering is merely their opinion[,]”¹⁰¹ or “to temper the strength of the claim.”¹⁰²

Although these were positive effects of the NRC report, Cole and Edmond discounted both situations.¹⁰³ They concluded that the first situation is very rare because, unlike most forensic techniques, GC-MS analysis is a scientifically valid technique for testing unknown substances, as the 2009 NRC report explicitly confirmed.¹⁰⁴ They are also skeptical of the second situation because a minimal change in the phrasing of an expert’s conclusion would not cure “the lack of validation testing and standardization at the heart of the NRC critique.”¹⁰⁵ Beyond these rare successes, according to the authors, most challenges have failed.¹⁰⁶ They concluded that “the most unfortunate development in relation to forensic science evidence in recent years is . . . the *apparent reluctance of trial and appellate judges to apply existing authority, particularly admissibility standards (e.g., the Daubert criteria), more aggressively.*”¹⁰⁷

Because of these limits, some argue that more emphasis should be given to improving the forensic disciplines before they get to the courtroom. As Professor Keith A. Findley notes, “the most efficacious approach might be to improve the quality of the evidence upstream of the trial—during the police investigation.”¹⁰⁸ This belief is somewhat understandable, given that “the trial process has not

99. Cole & Edmond, *supra* note 47, at 599.

100. *Id.* at 600.

101. *Id.* (citing *Commonwealth v. Joyner*, 4 N.E.3d 282, 289–90 (2014)) (noting that “[t]his is sometime described as *opinionization*”) (emphasis added).

102. *Id.* (citing *United States v. Taylor*, 663 F. Supp.2d 1170, 1180 (D.N.M. 2009)).

103. *Id.* at 599–601.

104. *Id.* at 599 (noting that “In these cases [the 2009 NRC report] 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” and that “in contrast to most of the forensic techniques criticized in [the 2009 NRC report], 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”).

105. *Id.* 601.

106. *Id.* 601–611.

107. *Id.* 616 (emphasis added).

108. Keith A. Findley, *Judicial Gatekeeping of Suspect Evidence: Due Process and Evidentiary Rules in the Age of Innocence*, 47 GA. L. REV. 723, 758 (2013). Findley refers to a similar view in Randolph N. Jonakait, *Making the Law of Factual Determinations Matter More*, 25 LOY. L.A. L. REV. 673, 675 (1992).

proven to be very effective at sorting true from false evidence in these suspect categories.”¹⁰⁹ Also, since substantial efforts and resources have been put into forensic fields since the 2009 NRC Report, it is fair to expect that positive changes will take place sooner or later. For these commentators, reforms in forensic practice are expected to minimize “the strain on the truth-seeking functions of the adversary adjudicative process.”¹¹⁰ Thus, although the current admissibility standard for forensic evidence is lenient, successful reforms in forensic disciplines are expected to not only improve flawed forensic evidence but also weed out bad science from the courts.

This approach, however, is a somewhat naïve expectation. The two stages are influenced by each other; the relationship is not one-way. If courts are willing to admit forensic science in its current state, there is no urgent need (or incentive) for forensic communities to conduct more rigorous scientific testing. Professor William C. Thompson labelled this phenomenon as a “codependency” between judges and forensic science.¹¹¹ He explained that, “[l]ike parents who are afraid to discipline a wayward teenager for fear of losing his love and support, judges, by this account, are afraid to hold forensic science to strict admissibility standards for fear of losing forensic evidence.”¹¹² According to Thompson, the lenient application of the *Daubert* standard ultimately impedes the improvement of forensic science. Strengthening forensic evidence without judicial “tough love” might be nothing more than a pipedream.

In addition, courts have not been equally concerned with all the *Daubert* factors. As Professor Jonathan J. Koehler pointed out, although the *Daubert* Court listed “error rate” as one of the factors for courts to consider, that factor has been neglected.¹¹³ This is because, despite the importance of error rate in judging reliability,¹¹⁴ the *Daubert* trilogy did not provide clear criteria for lower courts to judge error rate.¹¹⁵ Therefore, forensic disciplines have not cared

109. Findley, *supra* note 108, at 758.

110. *Id.* at 759.

111. Thompson, *supra* note 34, at 38.

112. *Id.* at 38–39. Thompson urged that “courts need to exercise a little ‘tough love’ and not continue to tolerate (and thus enable) the deficiencies identified in the NRC report.” *Id.* at 39 n.14. He continued that “Otherwise, . . . you’ll be co-dependent forever.” *Id.*

113. Jonathan J. Koehler, *supra* note 84, at 5. Koehler suggests a new type of proficiency test to identify error rates “under various real-world conditions,” because he thinks the current proficiency tests are not adequate for measuring accuracy. *Id.* at 9.

114. *Id.* at 21 (noting that “error rate is the *single most important component* of a reliability assessment”) (emphasis original).

115. Koehler noted that:

much about measuring error rate. Even though the 2009 NRC Report emphasized the rigorous estimation of error rate in the *Daubert* factors,¹¹⁶ the forensic community has not changed much, largely because the courts still believe that “the lack of reliable error rate is not a serious problem.”¹¹⁷ As Koehler indicated, “[i]n most areas of forensic science, we can’t *even begin to estimate* accuracy rates (or error rates).”¹¹⁸ Actually, the comprehensive review of forensic literature analyzed in 2016 PCAST Report confirmed Koehler’s assertion. The report found clear empirical evidence of the reliable error rate in DNA analysis (for Single-Source and Simple-Mixture Samples¹¹⁹) and Latent Fingerprint Analysis, and recognized some limited evidence in Firearms Analysis, and DNA analysis (for Complex Mixtures¹²⁰).¹²¹ In other areas, the report found that there is still no relevant empirical evidence.¹²²

After all, forensic disciplines seem to have not yet embraced real scientific features. Although the 2009 NRC Report emphasized the need for independent and rigorous research, those efforts in the National Institute of Justice (“NIJ”)—the most important forensic research institution—are still limited.¹²³ A recently published report

Although many courts that reviewed forensic science evidence under the *Daubert* standard have tried to consider how well each of the five factors are met in the target case, discussions of the error rate factor have largely been superficial. One reason for this is that neither *Daubert* nor its progeny clarified what courts are supposed to look for when they consider the “known or potential rate of error” of a forensic method. A natural interpretation would seem to be that courts should check to see if the casework error rate for a challenged forensic method is sufficiently low in cases where error rate is a relevant consideration. But even if this interpretation were correct and adopted by courts, key questions would remain. What type of proof should courts rely on as proof of a low casework error rate? How low is low enough? Does the evidentiary opponent have an obligation to show that the error rate is insufficiently low? These questions, which have not been addressed by the Court....

Id. at 20, 21.

116. 2009 NRC REPORT, *supra* note 3, at 117–22.

117. Koehler, *supra* note 84, at 28. After reviewing decisions addressing error rate issues, he concluded that the 2009 NRC Report failed to bring “a sea change” to the measuring of error rates for fingerprints, firearms and tool marks, or even DNA evidence. *Id.* at 23–28.

118. *Id.* at 31 (emphasis added).

119. This analysis is “the vast majority of DNA analysis” and involves “samples from a single individual or from a simple mixture of two individuals (such as from a rape kit).” 2016 PCAST Report, *supra* note 84, at 7.

120. This analysis involves “complex mixture of biological samples from multiple unknown individuals in unknown proportions. (Such samples arise, for example, from mixed blood stains, and increasingly from multiple individual touching a surface).” *Id.*

121. *See Id.* at 7–14.

122. *Id.*

123. THE SCIENTIFIC ROLE OF THE NIJ, *supra* note 77, at 3. This report also explains “a unique

found that “the priority issues emphasized in the [NIJ’s] solicitations appear to be reactive,” and the current research “does not adequately represent the needs of the broad range of forensic science disciplines.”¹²⁴ Even though new federal forensic agencies, like the NCFS, were launched, they are consistently criticized for leadership problems.¹²⁵ In addition, even after the 2016 PCAST Report was published, many forensic-science organizations still suggested that “the validity and reliability of [forensic feature-comparison method] could be established without actually empirically testing the method in an appropriate setting.”¹²⁶ However, as the report rightly noted, “empirical testing is the only way to establish the validity and degree of reliability of such an empirical method.”¹²⁷ This wide spread recognition in forensic communities would impede forensic science to embrace real scientific features, even though the discussion about the research culture at individual crime laboratories began.¹²⁸ Therefore, in forensic science, it is still not clear whether the self-correction mechanism, one of the key features of science, can work properly.

B. The Ineffectiveness of Strengthening Traditional Adversary Rights

Although there have been some efforts to strengthen tradition adversary rights (constitutional protections), the effects may not be as powerful as expected. Courts and scholars have recognized that the *Daubert* standard is limited when responding to the deficiencies of forensic science. Therefore, they have attempted to equip the defense with tools for challenging the prosecution. In some sense, these tools are expected to complement (1) insufficient reforms to the actual reliability of forensic science and (2) lenient court review. However, it is not clear to what degree these changes can combat the prejudicial effect of flawed forensic evidence.¹²⁹

The defense’s tools include confrontational rights and ineffective

and critical role” of National Institute of Justice in forensic science research. *Id.*

124. *Id.* at 4. The report recommends that the National Institute of Justice should “develop a formal and comprehensive strategic plan for its forensic science research,” and “establish a research advisory board that includes a broad array of scientists, including forensic science researchers and practitioners.” *Id.* at 5.

125. See Spencer S. Hsu, *U.S. judge quits commission to protest Justice Department forensic science policy*, WASH. POST (Jan. 29, 2015), https://www.washingtonpost.com/local/crime/us-judge-quits-commission-to-protest-justice-department-forensic-science-policy/2015/01/29/cbed0a84-a7bb-11e4-a2b2-776095f393b2_story.html?utm_term=.c8e03f815f77.

126. See 2017 PACST ADDENDUM, *supra* note 86, at 3–4.

127. *Id.* at 4.

128. See Mnookin, et al., *supra* note 33, at 775–78.

129. See Cole & Edmond, *supra* note 47, at 598–99.

assistance of counsel claims. The Supreme Court quickly responded to the 2009 NRC Report.¹³⁰ In *Melendez-Diaz v. Massachusetts*, the U.S. Supreme Court held that forensic evidence could not be presented by certification or affidavit; forensic evidence must instead be presented by live testimony subject to cross-examination.¹³¹ The Court substantially cited the 2009 NRC Report and held that defendants should have the right to confront forensic scientists.¹³² In *Hinton v. Alabama*, the Court reinforced the defendant's right to effective assistance of counsel when using and challenging forensic science.¹³³ It held that counsel's failure to seek additional funding to hire a better expert constituted deficient performance and prejudiced the defendant.¹³⁴ As Professor Brandon L. Garrett noted, "the [*Hinton*] Court had strengthened the obligations of defense counsel to litigate forensics."¹³⁵

However, these enhanced rights are doubtful to be ineffective at screening forensic evidence. This is not to say that strengthening those rights are meaningless; they are the valuable fruits of recent efforts to improve forensic evidence. It might be also true that the Court has made sincere efforts in areas where it has a high institutional competence. Nevertheless, as co-chairs of the Senior Advisors to the PCAST Working Group, Judge Harry T. Edwards and Professor Jennifer L. Mnookin noted, "experience has shown that, at least in criminal trials, the suggestion that the adversarial system represent an adequate means of demonstrating the unreliability of forensic evidence is mostly *fanciful*."¹³⁶ Perhaps,

130. See *Melendez-Diaz v. Massachusetts*, 557 U.S. 305, 317–21 (2009).

131. *Id.* The petitioner argued that the admission of forensic certificates in lieu of live testimony of the forensic analysts who conducted the forensic examinations at issue violated his confrontation right under the Sixth Amendment. *Id.* at 308–9. The Court first determined the class of testimonial statements by citing *Crawford v. Washington*. *Id.* at 309–10 (discussing types of testimonial evidence) (quoting *Crawford v. Washington*, 541 U.S. 36, 51–52 (2004)). Because "[t]he documents at issue here, while denominated by Massachusetts law 'certificates,' are quite plainly affidavits," the Court reasoned, "[t]hey are incontrovertibly a solemn declaration or affirmation made for the purpose of establishing or proving some fact." *Id.* at 310 (some quotation marks and citations omitted). The majority rejected the dissenting opinion arguing that there has been an accepted rule governing the admission of scientific evidence, and deemed the opinion as mere an attempt to resurrect *Ohio v. Roberts*, 448 U.S. 56 (1980) (holding that the adequate indicia of reliability is required for hearsay to meet the Confrontation Clause standard), which was overruled by *Crawford* five years before *Melendez-Diaz*. *Id.* at 312–13. *Crawford* overruled *Roberts* by differentiating testimonial and non-testimonial hearsay. *Crawford*, 541 U.S. at 68.

132. *Melendez-Diaz*, 557 U.S. at 318.

133. *Hinton v. Alabama*, 134 S.Ct. 1081 (2014).

134. *Id.* at 1088–89. Although additional funding to hire an expert was available at the time of trial, counsel mistakenly believed that the "funding was capped at \$1,000." *Id.* at 1088. The Court held that the defense counsel failed to introduce a competent tool mark examiner. *Id.* at 1089.

135. Brandon L. Garrett, *Constitutional Regulation of Forensic Evidence*, 73 WASH. & LEE L. REV. 1147, 1148–49 (2016) (citing *Hinton v. Alabama*, 134 S.Ct. 1081, 1088 (2014)).

136. Harry T. Edwards and Jennifer L. Mnookin, *A wake-up call on the junk science infesting our*

these changes could be partial remedy and may fail to counteract insufficiently reviewed forensic evidence.

In a similar vein, there are efforts to enhance *Brady* obligations.¹³⁷ For instance, in 2015, the West Virginia Supreme Court extended *Brady* obligations to plea negotiations.¹³⁸ In *Buffey v. Ballard*, the court held that the suppression of exculpatory DNA evidence in plea negotiations violated the defendant's due process rights.¹³⁹ Some scholars also argue that forensic “laboratories [should] consider extending something akin to *Brady* duties to [forensic] examiners themselves.”¹⁴⁰ Given that *Brady* is already applied to the information that police possess, they argue, “there is no reason that this should not apply to forensic scientists.”¹⁴¹ These proposals are valuable in terms of fundamental fairness.¹⁴² However, the extension of *Brady* obligations to pre-plea discovery is only limited to one small state, West Virginia, and the discussion of applying *Brady* duties to scientists has just started.

IV. POLICY DIRECTION

A. The Need to Read Daubert Leniently for Defendants

The reliability of forensic evidence will not be strengthened without external pressure—and in particular, without pressure from the courts. Also, it is not clear if enhancing traditional trial rights will help to filter out forensic evidence with a weak scientific grounding. Thus, the courts should consider more influential changes.

A simple solution would be urging the strict review of scientific reliability, as the *Daubert* standard was initially expected to bring. It

courtrooms, WASH. POST, Sep. 20, 2016 (internal quotation mark omitted and emphasis added), https://www.washingtonpost.com/opinions/a-wake-up-call-on-the-junk-science-infesting-our-courtrooms/2016/09/19/85b6eb22-7e90-11e6-8d13-d7c704ef9fd9_story.html?utm_term=.b7c0b91c3842.

137. *Brady v. Maryland*, 373 U.S. 83 (1963) (holding that the Due Process Clause requires the prosecution to provide exculpatory evidence to the defense).

138. *Buffey v. Ballard*, 2015 WL 7103326 (W.Va. 2015).

139. *Id.*

140. Mnookin, et al., *supra* note 33, at 776. This article articulates the reason in this way: “[T]here is no reason that [*Brady* violation] should not apply to forensic scientists. . . . The purpose of either a disclosure requirement or enhanced reporting norms is in part to increase the degree of perceived and subjectively felt independence from law enforcement, even if no formal institutional realignment takes place.” *See id.*

141. *Id.* (citing *Kyles v. Whitley*, 514 U.S. 419 (1995)). They expect this duty to increase “the degree of perceived and subjectively felt independence from law enforcement,” which would lessen the “structural risks of both bias and partisanship stem[ming] from the institutional location of crime laboratories.” *Id.* at 774, 776.

142. *Id.* at 776.

is, however, somewhat unrealizable. Cole and Edmond openly describe their perception about how legal professionals might recognize forensic reform. They note that:

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.¹⁴³

This widespread recognition among legal practitioners shows the inherent difficulty in depending on a strict application of reliability review to forensic evidence.

Meanwhile, the current practices negatively impact defendants. As explained above, courts tend to apply a lenient standard only when admitting the state's forensic science evidence. As Professor David L. Faigman noted, it is the prosecution that is often allowed to present forensic evidence without a minimal scientific basis.¹⁴⁴ For example, drug detectives usually testify about their special knowledge, without any empirical basis; their testimonies mostly rely on their training and longtime experience.¹⁴⁵ Such testimony is usually admitted.¹⁴⁶

143. Cole & Edmond, *supra* note 47, at 616 (citing Scalia J. in *Kansas v. Marsh*, 126 S. Ct. 2516 (2006)) (emphasis added).

144. See DAVID L. FAIGMAN ET AL., 1 MOD. SCI. EVIDENCE § 1:35, *Applying Daubert: Criminal cases* (2017–2018 Edition), Westlaw (database updated December 2017) (noting that:

An important issue pertinent to *Daubert's* application to criminal cases concerns the rigor with which courts will assess forensic evidence. Prosecutors rely heavily on empirical techniques that remain largely untested, techniques, such as handwriting identification and bitemarks, that have a long tradition of admission, but whose continuing vitality under *Daubert* remains in doubt. Indeed, the vitality of *Daubert* itself might be assessed on whether the courts embrace the gatekeeping function seriously enough to challenge forensic scientists to live up to the title scientist).

145. See Joelle Anne Moreno, *What Happens When Dirty Harry Becomes an (Expert) Witness for the Prosecution*, 79 TUL. L. REV. 1, 33–35 (2004) (“There is no indication in any related literature that there has ever been a real effort to study or test the reliability of any drug jargon definitions.”). *Id.* at 34.

The same is true regarding the prosecution's social syndrome evidence (e.g., Shaken Baby Syndrome) despite lacking a concrete scientific basis.¹⁴⁷ It only dubiously clears the *Daubert* standard, but is nonetheless routinely admitted, largely because of conventional practice.¹⁴⁸

In contrast, defense-proffered evidence tends to be scrutinized more strictly. Professor D. Michael Risinger conducted an in-depth empirical study of state and federal cases after *Daubert*.¹⁴⁹ For criminal cases in federal district courts, he found that two-thirds of the prosecution challenges to defense proffers were accepted (28/42), but only 8% of defense challenges to prosecution proffers were accepted (1/11).¹⁵⁰ Risinger also noted that “[e]vidence from state courts does not reveal a greatly dissimilar pattern.”¹⁵¹ A more recent study, conducted by Professor Jennifer L. Groscup, revealed an even more strikingly disproportionate result.¹⁵² It revealed that more than 95% of the prosecution's forensic experts are admitted at trial, while fewer than 8% of the defense's forensic experts are allowed to testify.¹⁵³ Of course, as Risinger points out, the reliability of the defense's forensic evidence may be relatively weak compared to the prosecution's, and dissimilar litigation strategies could also contribute to this disparity.¹⁵⁴ Nevertheless, the dramatic differences raise strong suspicions about the unequal application of *Daubert*

146. *See id.* at 3.

147. Deborah Tuerkheimer, *The Next Innocence Project: Shaken Baby Syndrome and the Criminal Courts*, 87 WASH. U. L. REV. 1, 34 (2009) (“the scientific underpinnings of SBS have crumbled over the past decade as the medical establishment has deliberately discarded a diagnosis defined by shaking.” *Id.* at 11; Findley, *supra* note 67, at 920 (discussing the weak scientific basis of Rape trauma syndrome evidence).

148. Tuerkheimer, 87 WASH. U. L. REV. at 34. (“[I]t is . . . quite likely that judges are allowing this type of testimony because our justice system is structured in a way that makes its admission the default. “[T]he standard for admissibility is relevance and reliability, not certainty,” as courts often remark when allowing SBS testimony.” (quoting *People v. Martinez*, 74 P.3d 316, 322 (Colo. 2003)).

149. D. Michael Risinger, *Navigating Expert Reliability: Are Criminal Standards of Certainty Being Left on the Dock*, 64 ALB. L. REV. 99 (2000).

150. *Id.* at 109–10.

151. *Id.* at 110. In analyzing state courts, he did not separate the trial court and the appellate court. *Id.* at 111 n.42.

152. *See* 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).

153. *Id.* at 346. His data, 693 criminal cases, includes both federal and state courts. *Id.* at 344.

154. Risinger, *supra* note 149, at 108 (“Of course, none of this goes directly to the validity of any given decision, and because different forms of expertise are commonly proffered in civil and criminal cases, these numbers do not directly establish disparate standards of dependability in the two contexts, but they are fairly striking in their own right. Maybe it is true that the prosecution always proffers highly dependable expertise, and that criminal defendants and civil plaintiffs usually proffer garbage, or that prosecutors and civil defendants only object to low quality proffers whereas criminal defendants (and to a lesser extent civil plaintiffs) object to demonstrably dependable evidence as a matter of course.”).

standards. At present, there is no clear evidence that this situation has improved.

To reiterate: the courts have shown no willingness to strictly apply *Daubert* in criminal cases; deeply rooted norms in the legal profession create additional, practical difficulties when applying the *Daubert* standard against government forensic evidence; and the courts, whether consciously or unconsciously, review the reliability of evidence in a way that is unfair to the defendant.

A change of focus is required. This article argues that courts should consciously apply a more permissive standard towards defendants' forensic evidence. A permissive application of *Daubert* would give defendants more opportunities to introduce their own forensic experts, who may then present their own interpretations of evidence or rebut government witnesses. This helps defense to implement a larger variety of strategies; the defense expert may support the defendant's claims with independent data, or point out the weaknesses in government's expert testimony; and the defense expert can also expand the scope of discussion and analyze the reliability, weight, and even the credibility of government evidence. Perhaps, the existing perception that adversary system does not work properly for filtering problematic forensic evidence mostly points out the ineffectiveness of cross-examination by defense attorneys. Although it is sometimes an efficient tool to discredit the prosecution's forensic evidence, generally, a limited range of subject is covered during the lawyer's cross-examination.¹⁵⁵ On the contrary, expert analysis is likely to go well beyond defense counsel's cross-examination.

Defense experts can also help strengthen the reliability of forensic evidence. Not guilty verdicts usually reflect the jury's underappreciation for the weight of the evidence in question. The government is then encouraged to provide more rigorous evidence if it struggles to obtain convictions. Prosecutors would ensure that their evidence is fully acceptable under the *Daubert* standard. They would also push (1) to rectify the comprehensive issues pointed out in the 2009 NRC Report and particularly (2) to pursue "empirical studies designed to test error rates and accuracy in conditions akin to those

155. Lawyers wish to avoid discussion about unfamiliar concepts, which might fall within the expertise of witnesses. James W. McElhaney, *Cross-Examining Expert Witnesses*, 3 LITIGATION 41, 44 (1977). Instead, the lawyer usually attempts to control the style of the witness' response. *Id.* at 43. At the beginning of cross-examination, counsel requires an opposing expert to answer only "yes or no" to all questions. *Id.* By doing this, defense counsel usually discourages a witness's non-responsive answer and overcomes the shortage of professional knowledge in forensic disciplines. *Id.* at 43-44. Sometimes, this is a very effective strategy. However, it narrows the scope of cross-examination.

found in the real world” in 2016 PCAST Report.¹⁵⁶ Such efforts would gradually increase the reliability of government evidence.

The history of DNA evidence that obtained the present high reliability through “the DNA war” may support this claim. In the late 1980s, DNA technology was rapidly developing and started being presented in court.¹⁵⁷ Defendants challenged the admissibility of DNA evidence and courts held the government to more rigorous scientific standards.¹⁵⁸ This was made possible by defense experts, who carefully targeted the unsupported claims of prosecution experts.¹⁵⁹ Although there was some resistance from law enforcement, forensic scientists began to use more conservative, scientifically rigorous methods.¹⁶⁰ Professor William C. Thompson cites DNA as evidence that “successful challenges to the admissibility of forensic evidence are helpful in achieving improvements in forensic science.”¹⁶¹ Like the DNA war, attacks from defense experts on other types of forensic evidence are expected to ultimately improve the underlying science.

Adversarial court challenges mirror the scientific method, and therefore adversarial testing can be implemented to improve scientific theories. According to Karl Popper, whom the Court relied upon when establishing the *Daubert* standard,¹⁶² “statements or systems of statements, in order to be ranked as scientific, must be capable of conflicting with possible, or conceivable observations.”¹⁶³ Popper regarded scientific progress as the result of proving that good ideas are wrong, so that they can be replaced by even better ideas.¹⁶⁴ He famously labeled this process as “falsification.”¹⁶⁵ A similar point is found in the Reference Manual on Scientific Evidence, which most

156. Edwards & Mnookin, *supra* note 136.

157. See William C. Thompson, *The National Research Council's Plan to Strengthen Forensic Science: Does the Path Forward Run Through the Courts?*, 50 JURMETRICS J. 35, 40-41 (2009).

158. See *id.*

159. See *id.* at 41, 44.

160. Professor Thompson noted that “[a]lthough these rulings caused an atmosphere of crisis in the law enforcement community and were characterized by some as a judicial rejection of science, the rulings did not actually prevent lawyers from making use of DNA evidence.” *Id.* at 42. He continued that “[i]n some jurisdictions, DNA laboratories began using a more conservative method for computing the frequency of DNA profiles” that recommended by prestigious scientific institution. *Id.*

161. *Id.* at 44.

162. See Gary Edmond & David Mercer, *Conjectures and Exhumations: Citations of History, Philosophy and Sociology of Science in US Federal Courts*, 14 LAW & LITERATURE 309, 310-29 (2002).

163. Sven Ove Hansson, *Science and Pseudo-Science*, in THE STANFORD ENCYCLOPEDIA OF PHILOSOPHY (Sep. 3, 2008) (quoting KARL POPPER, CONJECTURES AND REFUTATIONS. THE GROWTH OF SCIENTIFIC KNOWLEDGE 39 (1962)), <https://plato.stanford.edu/entries/pseudo-science/>.

164. *Id.*

165. *Id.*

federal judges rely on. In that manual, Professor David Goodstein explains that “[science] is an arena in which ideas do battle, with observations and data the tools of combat.”¹⁶⁶ As noted, forensic science lacks this combative process, because it is usually developed in a government crime lab for targeted use in criminal litigation.¹⁶⁷ Defense experts allow forensic evidence to be more frequently tested in an adversarial setting and ultimately strengthen its scientific basis.

Shaken Baby Syndrome (“SBS”) cases are a good example of the process this article envisions. According to Professor Keith A. Findley, SBS cases present a stark example of judicial reliance on forensic science, because these are cases “where the science is used to prove all elements of the crime.”¹⁶⁸ Although the prosecution’s SBS evidence usually has weak scientific grounding,¹⁶⁹ it has passed *Daubert* muster without serious difficulty so far.¹⁷⁰ Trial judges may not be willing to reject SBS evidence, because it is the best available evidence the prosecution can offer. This generous application of *Daubert* helps the prosecution secure convictions. However, since the courts continue to admit SBS evidence with a weak scientific basis, and that evidence convicts defendants, the state is discouraged from changing its practices. If the defendant’s expert testifies in the courts, the battle of experts will effectively reveal the weaknesses of prosecution’s SBS evidence. Even if the testimony of the defense expert is shaky, it can be easily explored by “[v]igorous cross-examination and presentation of contrary evidence.”¹⁷¹ This kind of information would be “of genuine assistance to the trier.”¹⁷² Given the narrow pool of experts available to the defense, a more permissive version of the *Daubert* standard will help the defense submit more forensic evidence to the court. And this would

166. David Goodstein, *How Science Works*, in REFERENCE MANUAL ON SCIENTIFIC EVIDENCE 34, 44 (Federal Judicial Ctr. ed., 3th ed., 2011).

167. See *supra* note 55–60 & accompanying text.

168. Keith Findley et al., *Examining Shaken Baby Syndrome Convictions in Light of New Medical Scientific Research*, 37 OKLA. CITY U. L. REV. 219, 223 (2012).

169. See Keith A. Findley, et al., *Shaken Baby Syndrome, Abusive Head Trauma, and Actual Innocence: Getting It Right*, 12 HOUS. J. HEALTH L. & POL’Y 209, 298–306 (2012) (discussing weak scientific basis of SBS testimony).

170. See Edward J. Imwinkelried, *Shaken Baby Syndrome: A Genuine Battle of the Scientific (And Non-Scientific) Experts*, 46 CRIM. L. BULL. 156, 165–69 (2010) (explaining that SBS evidence became admissible in most court in a short time); Jennifer E. Laurin, *Criminal Law’s Science Lag: How Criminal Justice Meets Changed Scientific Understanding*, 93 TEX. L. REV. 1751, 1771 (2015) (“While courts have begun to view the prior consensus about a unique etiology of shaken-baby injuries as undermined by developments in the medical field, the prosecutorial community has been far more skeptical.”).

171. *Daubert v. Merrell Dow Pharmaceutical, Inc.*, 509 U.S. 579, 596 (1993); see *Rock v. Arkanasa*, 483 U.S. 44, 61 (1987).

172. Imwinkelried, *supra* note 170, at 185.

ultimately encourage the adversary testing of government evidence.

Opponents might argue that this proposal is logical but lacks legal grounds. But there is indeed jurisprudential support for this approach. Some scholars emphasize the exclusive constitutional right for defendants to present material evidence, a right that the prosecution does not enjoy.¹⁷³ Professor Janet Hoeffel argues that the criminal defendant enjoys this right under the Sixth Amendment's Compulsory Process Clause.¹⁷⁴ Professor Katherine Goldwasser asserts that jury trials were intended to allow "the unusual, unexpected, or even implausible stories" of criminal defendants.¹⁷⁵ Above all, they argue that there is a constitutional justification for a very lenient threshold for evidence presented by defendants.

Judges also have the discretion to apply the admissibility rules leniently. The Federal Rules of Evidence ("FRE"), are generally considered to create a lenient standard for admitting expert testimony.¹⁷⁶ When *Daubert* abolished the *Frye* test, the Court was recognizing that the FRE rule on expert evidence could create a more lenient standard.¹⁷⁷ Thus, although the positivist approach in the *Daubert* trilogy caused a stricter admissibility standard,¹⁷⁸ the rule's original intent was in part to lower the standard.¹⁷⁹ Also, both *Daubert* and *Kumho Tire Company, Ltd. v. Carmichael* explicitly acknowledge the broad discretion of trial judges.¹⁸⁰ This discretion,

173. Janet C. Hoeffel, *The Sixth Amendment Lost Clause: Unearthing Compulsory Process*, 2002 WIS. L. REV. 1275 (2002); Katherine Goldwasser, *Vindicating the Right to Trial by Jury and the Requirement of Proof beyond a Reasonable Doubt: A Critique of the Conventional Wisdom about Excluding Defense Evidence*, 86 GEO. L.J. 621 (1998).

174. U.S. CONST. amend. VI. ("In all criminal prosecutions, the accused shall enjoy the right . . . to have compulsory process for obtaining witnesses in his favor."); Hoeffel, *supra* note 173, at 1360–61 ("While the one-sided application of a favorable constitutional standard may appear unfair, it is not. In a criminal case, the parties are assumed to be on an unequal footing. The bundle of rights in the Sixth Amendment—the right to notice, counsel, confrontation and compulsory process—were intended to offset the inherent imbalance between the relatively powerful State and the powerless, resourceless defendant. The parties are also on an unequal footing, however, because the defendant's very liberty is at stake. The criminal justice system was designed to reflect the most undesirable verdict as that of the conviction of the innocent.") (citation omitted).

175. Goldwasser, *supra* note 173, at 639.

176. *Daubert*, 509 U.S. at 588 (noting that the "drafting history [of Federal Rule of Evidence 702] makes no mention of *Frye*, and a rigid general acceptance requirement would be at odds with the liberal thrust of the Federal Rules and their general approach of relaxing the traditional barriers to opinion testimony") (citing *Beech Aircraft Corp. v. Rainey*, 488 U.S. 153, 169 (1988)) (quotation marks omitted).

177. *Id.*

178. Christopher Slobogin, *The Structure of Expertise in Criminal Cases*, 34 SETON HALL L. REV. 105, 106–7 (2003).

179. Hoeffel, *supra* note 173, at 1359 ("*Daubert* meant to liberalize the rules of evidence governing the admissibility of scientific evidence and intended that 'shaky but reliable' evidence be submitted to the jury.")

180. *Daubert*, 509 U.S. at 589–592; *Kumho Tire Company, Ltd. v. Carmichael*, 526 U.S. 136,

combined with the constitutional grounds discussed above, creates a concrete theoretical basis for applying forensic admissibility standards more leniently towards defendants. Based on this analysis, this article's suggestion could be achieved without seismic changes.

B. Methods for Lenient Admissibility

Critics might argue that a more lenient standard would allow too much unreliable forensic evidence to be admitted into court—a concern that there will be no limit to admissibility. Permitting fundamentally unreliable evidence would conflict with the clear dictates of *Daubert*. As *General Electric Co. v. Joiner*¹⁸¹ observed, “nothing in either *Daubert* or the Federal Rules of Evidence requires a district court to admit opinion evidence that is connected to existing data only by the *ipse dixit* of the expert.”¹⁸² To address this concern, this article formulates specific standards to avoid opening the door to groundless forensic evidence. Although this is an inherently difficult task; tension always arises where law and science meet,¹⁸³ fortunately the scholarship on “law and science” is very rich. Based on these studies, some examples of specific standards, although not exclusive, will be discussed below.

This will be examined from two dimensions: (1) The qualification standard of forensic scientists; and (2) the validity of the forensic evidence. For the first dimension, the qualifications of experts should be evaluated to include witnesses with expertise in fields that are adjacent or relevant to testimony proffered by the prosecution. The situation is when competing experts are discussing the same evidence, but their expertise is different. For example, consider the following hypothetical:

The prosecutor prepares a bitemark forensic expert in a rape case. The defense counsel, however, has difficulty in finding an appropriate bitemark expert in the community. Accordingly,

152–53 (1999).

181. *General Electric Co. v. Joiner*, 522 U.S. 136 (1997).

182. *Id.* at 146.

183. This is because law and science differ essentially. Law pursues justice in individual cases, whereas science seeks truth through valid generalization. Law must make timely and final decisions for efficient dispute resolution, whereas truth from scientific research is never absolute or ultimate. Because of these differences, there is tension when science meets law in the courtroom. In this vein, Professor David Goodstein once noted that “[t]he presentation of scientific evidence in a court of law is a kind of shotgun marriage between the two disciplines.” See Goodstein, *supra* note 166, at 52 (Federal Judicial Ctr. ed., 3rd ed., 2011). This conflict may be especially striking in criminal cases where the life and liberty of human beings are at stake.

defense counsel decides to hire a statistician as an alternative expert, because he knows that the scientific basis for the individualization claimed by the prosecution's expert is weak. The statistician tries to show that there is no statistical basis for the individualization claims largely based on her own research of the existing literature. However, the defense counsel is concerned that the statistician does not have any expertise in bite mark evidence (e.g., degree, training, publication or prior testimony).¹⁸⁴

In this case, the statistician's lack of expertise with bite mark evidence should not be an insurmountable obstacle. If a defendant's expert testimony provides information that can help the jury make a judgment—to weigh the prosecution's individualization claim—it should be allowed.

This proposal can bring positive changes. A wide range of experts will continuously point out the problem—the lack of scientific basis in forensic evidence—and help to expose the true picture of forensic science to decision makers. Especially, the core issues discussed in the 2016 PCAST Report (foundational validity,¹⁸⁵ validity as applied¹⁸⁶) could be more scrutinized in the courtroom. Further, an active involvement of other field experts will ultimately propel forensic disciplines to achieve the ultimate objective of enhancing the accuracy of forensic evidence. In some sense, this aspect also reconciles with the point in 2016 PACST Report, which emphasized the need for collaboration with non-forensic scientists.¹⁸⁷

State v. Romero provides valuable lessons in evaluating the qualifications of experts.¹⁸⁸ In *Romero*, the defense presented an experimental-design expert to criticize “the scientific reliability of drawing conclusions by comparing toolmarks.”¹⁸⁹ Although he was a nationally known experimental design expert, the trial court excluded

184. This is a hypothetical scenario created by the author.

185. Foundational validity means “the scientific standard corresponding to the legal standard of evidence being based on ‘reliable principles and methods.’” 2016 PCAST Report, *supra* note 10, at 43.

186. Validity as applied means “the scientific standard corresponding to the legal standard of an expert having ‘reliably applied the principles and methods.’” *Id.*

187. See 2017 PACST ADDENDUM, *supra* note 86, at 9 (“In addition, progress would be advanced by the creation of a cross-cutting Forensic Science Study Group—involving leading forensic and non-forensic scientists in equal measure and spanning a range of feature-comparison disciplines—to serve as a scientific forum to discuss, formulate and invite broad input on (i) empirical studies of validity and reliability and (ii) approaches for new technology development, including transforming subjective methods into objective methods. Such a forum would complement existing efforts focused on developing best practices and informing standards and might strengthen connections between forensic disciplines and other areas of science and technology.”).

188. *State v. Romero*, 239 Ariz. 6, 365 P.3d 358 (2016).

189. *Id.* at 361.

his testimony because he had “never conducted a toolmark analysis, never attempted to identify different firearms, and never conducted research on firearm identification.”¹⁹⁰ The Arizona Supreme Court reversed the decision. The court reasoned that the defense expert was qualified because his testimony was confined to analysis of the experimental aspect of the government’s forensic evidence.¹⁹¹ The court regarded the expert as qualified to evaluate the evidence, even though he was not a pure expert of the specific field of evidence. Like *Romero*, the qualifications of a defense expert do not need to be too high, so long as he can analyze some aspect of the particular evidence. This mitigated standard allows a discussion of forensic evidence from a variety of angles.

In a similar vein, the interpretation of “task at hand” also needs to be flexible when applied to a defense expert. In *Kumho Tires*, the Court emphasized the “task at hand,” requiring specific expertise on the issues in question.¹⁹² Experts must demonstrate their specific expertise on the key issues, rather than general expertise in the relevant area.¹⁹³ Unfortunately, *Kumho Tires* allows an overly narrow interpretation of “task at hand.”¹⁹⁴ When judges strictly apply the element against the defendant, it can create difficulty for the defense to find a suitable expert.

This article has more to say about the second dimension, which addresses the validity of forensic evidence. When judging validity of forensic evidence, there should be different standards depending on the type of science. In a broad view, forensic evidence can be divided into two types: Framework evidence and diagnostic evidence,¹⁹⁵ but the difference has rarely been discussed as a factor of admissibility in courts.¹⁹⁶ Framework evidence “is a product of research that applies generally to all similarly situated cases,” and diagnostic evidence “is relevant to particular cases that might be instances of the general findings.”¹⁹⁷ Put simply, the former generalizes the world and provides society with a general framing of an issue, and the latter applies the former to a specific case. Framework science is not

190. *State v. Romero*, 236 Ariz. 451, 459, 341 P.3d 493, 501 (Ct. App. Div. 2 2014).

191. *Romero*, 239 Ariz. at 10.

192. DAVID L. FAIGMAN ET AL., §37:22. *Daubert admissibility – Expert Qualifications – Task-at-hand and scope of expertise*, 5 MOD. SCI. EVIDENCE (2017–2018 Edition), Westlaw (database updated December 2017).

193. *Id.*

194. *Id.*

195. David L. Faigman, John Monahan & Christopher Slobogin, *Group to Individual (G2i) Inference in Scientific Expert Testimony*, 81 U. CHI. L. REV. 417, 422–24 (2014).

196. *Id.* at 419–20.

197. *Id.* at 424.

necessarily more reliable, but it is inherently more scientific in the sense that it pursues a generalization.¹⁹⁸ It follows a scientific process to generate knowledge. Under this proposal, prosecutorial evidence would be challenged by the same scientific process.

This approach, which considers the types of science, has an additional advantage. The allegiance of experts in the adversarial system has long been a serious problem, and may detract from the search for truth.¹⁹⁹ Framework evidence involves less risk for improper allegiances, because it inherently pursues generalization (i.e., a scientific theory), and juries are less prone to being misled. In contrast, intuitively, diagnostic evidence is more vulnerable to party allegiances, because it asks the expert to apply general principles to the very dispute at issue. In fact, empirical studies on the allegiance of experts within the adversarial system mostly focus on diagnostic evidence.²⁰⁰ Perhaps, fact-finders can be more easily swayed by this kind of expert testimony.

Here, this article adds one more ambitious proposal that helps lower the validity standard for defense experts: A more permissible standard for the presentation of multiple forensic studies. Although the courts have rarely discussed this kind of issue, the Reference Manual on Scientific Evidence directly addresses this.²⁰¹ The manual raises the question of “[w]hen there is a *Daubert* challenge to an expert, should the court look at all the studies on which the expert relies for their collective effect or should the court examine the reliability of each study independently?”²⁰² It finds that “some [courts] appear to look at each study separately”²⁰³ and that *Joiner* can be interpreted as supporting this “slicing-and-dicing” approach.²⁰⁴ However, the manual points out that “scientific inference typically requires consideration of numerous findings,

198. *See id.* at 425 (“The most important difference in this calculus is that diagnostic testimony cannot be admissible unless the relevant framework is also admissible, whereas the converse is not true. Even if framework evidence is admissible, extrapolation from it to the individual case may not be scientifically or legally justifiable.”).

199. Experts have long been seriously criticized for their tendency to testify in favor of the party that retained them rather than objectively delivering their expertise. Despite concerns about the expert-dominated trial, the use of expert witnesses at trial has been continuously increasing. *See, e.g.*, Jennifer L. Mnookin, *Expert Evidence, Partisanship, and Epistemic Competence*, 73 *BROOK. L. REV.* 1009 (2008).

200. *See, e.g.*, Daniel C. Murrie et al., *Are Forensic Experts Biased by the Side that Retained Them?*, 24 *PSYCHOL. SCI.* 1889 (2013).

201. Margaret A. Berger, *The Admissibility of Expert Testimony*, in *REFERENCE MANUAL ON SCIENTIFIC EVIDENCE* 11, 19 (Federal Judicial Ctr. ed., 3th ed., 2011).

202. *Id.*

203. *Id.*

204. *Id.* (citing *General Electric Co. v. Joiner*, 522 U.S. 136 (1997)).

which, when considered alone, may not individually prove the contention.”²⁰⁵ It relies on the authorities of reputable institutions.

[M]any of the most well-respected and prestigious scientific bodies . . . consider all the relevant available scientific evidence, taken as a whole, to determine which conclusion or hypothesis regarding a causal claim is best supported by the body of evidence. In applying the scientific method, *scientists do not review each scientific study individually* for whether by itself it reliably supports the causal claim being advocated or opposed. Rather, . . . summing, or synthesizing, data addressing different linkages between kinds of data forms a more complete causal evidence model and can provide the biological plausibility needed to establish the association being advocated or opposed.²⁰⁶

Given the consensus in scientific communities, a more permissible standard should be applied to multiple forensic studies. With this generous approach, defendants could introduce more forensic evidence.

C. Refutations to Counter Arguments

Even if one agrees with this article’s proposal, one might still be concerned with whether it is a realistic possibility. An asymmetric standard, deliberately favorable to defendants, would inevitably meet resistance.²⁰⁷ Especially, given the political climate of the American criminal justice system, it would be challenging to implement such an idea.²⁰⁸ The prosecution already has a high burden of proof, and is required to prove every element of a crime beyond a reasonable doubt.²⁰⁹ A proposal imposing an additional disadvantage on the prosecution may have difficulty winning public approval.

205. *Id.* at 19–20 (citation omitted).

206. Berger, *supra* note 201, 20 (emphasis added) (citation and quotation marks omitted). As for “well-respected and prestigious scientific bodies.” the Manual lists following institutions: “the International Agency for Research on Cancer (IARC), the Institute of Medicine, the National Research Council, and the National Institute for Environmental Health Sciences.” *Id.*

207. See, e.g., Roger C. Park, *Daubert on a Tilted Playing Field*, 33 SETON HALL L. REV. 1113, 1115–17 (2003) (noting the legal and social problems that “asymmetrical approach” are expected to bring).

208. See, e.g., William J. Stuntz, *The Political Constitution of Criminal Justice*, 119 HARV. L. REV. 780 (2006). In addition, the prosecution already has a high burden of proof, which requires the state to prove every element of the crime beyond a reasonable doubt. That being so, it might be practically difficult to adopt an additional different standard that is more favorable to defendants.

209. *In re Winship*, 397 U.S. 358 (1970) (holding that proof beyond a reasonable doubt is required for criminal convictions).

This article's approach, however, has a clear strength. It has addressed (1) the weak scientific basis for forensic evidence and the court's insufficiency in reviewing its reliability,²¹⁰ (2) the minimal changes made after the 2009 NRC Report,²¹¹ and (3) the need to facilitate adversarial testing of evidence in the courts by lowering the standard of admissibility for defendants.²¹² The asymmetric standard is an appeal to science, and it may be more acceptable to the public when framed that way. The reason that forensic evidence has gained the public trust (e.g., CSI effect) is that forensic evidence seems more scientific than traditional evidence. If an asymmetric admissibility standard would truly harmonize forensics with other scientific fields, the public would be open to the suggestion. The same is true for legal practitioners. Most lawyers want their proffered expert testimony to have (at least seemingly) scientific grounds. Legal professionals endeavored to inject scientific features into law over 150 years ago.²¹³ Thus, both the general public and legal practitioners can find value in the asymmetric standard.

Some may argue that a battle of experts could have negative consequences. Several courts have expressed this view. In *Harrington v. Richter*, although the Supreme Court recognized the importance of expert witnesses in criminal cases, it was concerned that the defendant's expert "could shift attention to esoteric matters of forensic science, distract the jury from whether [the defendant] was telling the truth, or transform the case into a battle of the experts."²¹⁴ However, as noted, cross-examination's ability to impeach expert testimony is limited. Due to a lack of expertise, most lawyers focus on procedural matters rather than the substance of the testimony to avoid substantial discussions involving "the expert's scientific, technical, or other specialized knowledge."²¹⁵ As Professor Brandon L. Garrett noted, "the Court put *so much faith* in its Confrontation Clause rulings that it believes that cross-examination can effectively 'expose defects,' without presenting the jury with an expert with a contrary view of the evidence."²¹⁶ Cross-examination by lawyers may not be an adequate substitute for contrary expert testimony.

210. See Part II.B, III.A.

211. See *supra* note 92–107 and accompanying text.

212. See *supra* note 162–72 and accompanying text.

213. See Marcia Speziale, *Langdell's Concept of Law as Science: The Beginning of Anti-Formalism in American Legal Theory*, 5 VT. L. REV. 1, 26–30 (1980).

214. *Harrington v. Richter*, 562 U.S. 86, 108–109 (2011).

215. FED. R. EVID. 702(a).

216. Garrett, *supra* note 135, at 1160 (emphasis added).

The *Harrington* Court's reasoning is largely based on a concern that the jury will be confused by additional testimony. As Professor Susan Haack has noted, jurors necessarily face a "perfect epistemological storm," when determining the credibility and weight of expert testimony.²¹⁷ The more expert testimony presented, the bigger the storm. However, the American legal system is fundamentally designed around the jury's ability to resolve conflicts, no matter how complex they are. Many (but not all) experienced judges respect the jury's ability to understand and decide even complex cases.²¹⁸ Thus, before questioning the jury's ability, it is important to consider whether sufficient information has been given to the jurors to make adequate judgments. As the lenient standard for the defense is focused on when state presents forensic expert too, this article's proposal will prevent jurors from hearing the testimony of prosecution experts relying on weak scientific grounds.

In some cases, extremely complex, conflicting testimony from experts might distract or confuse the jury. This situation, however, is where even qualified experts disagree on an issue. The real problem is *not an excess of knowledge, but a lack of (reliable) knowledge*. Recently, the fallibility of forensic evidence has become increasingly well known. Hearing testimony from both sides would help fact-finders make informed decisions. If more expert testimony is admitted into evidence, more scrutiny is available.

If competing scientific views are repeatedly tried against each other, then inconsistent results could occur. In similar cases, one defendant might be convicted, whereas another could go free. In the context of expert testimony in SBS cases, Professor Deborah Tuerkheimer called this phenomenon "fluky justice."²¹⁹ Professor Keith A. Findley raises a similar concern. He notes that in SBS cases, "if doctors cannot agree on these complex and unresolved issues, it is unlikely that jurors or judges can do any better."²²⁰

However, these are exaggerated concerns. In the age of the "vanishing trial,"²²¹ trials are very rare. Only 5% of criminal cases are tried in courts.²²² Out of the cases that do go to trial, the defense

217. Susan Haack, *The Expert Witness: Lessons from the U.S. Experience*, 28 HUMANA MENTE: J. PHIL. STUD. 39, 42 (2015).

218. Prentice H. Mashall, *A View from the Bench: Practical Perspectives on Juries*, 1990 U. CHI. LEGAL F. 147, 147-48 (1990).

219. Deborah Tuerkheimer, *Science-Dependent Prosecution and the Problem of Epistemic Contingency: A Study of Shaken Baby Syndrome*, 62 ALA. L. REV. 513, 523-32 (2011).

220. Findley et al., *supra* note 169, at 305.

221. See Marc Galanter, *The Vanishing Trial: An Examination of Trials and Related Matters in Federal and State Courts*, 1 J. OF EMPIRICAL LEGAL STUD. 459 (2004).

222. See Stephanos Bibas, *Regulating the Plea-Bargaining Market: From Caveat Emptor to*

presents its own experts less than 2% of the time.²²³ “Fluky justice” is then a concern in *only* .1% of all criminal cases. However, if only the prosecution is allowed to present evidence with a weak scientific basis, the balance is shifted in favor of wrongful conviction, a much worse tragedy than “fluky justice.”²²⁴ Perhaps, it is unreasonable to expect *unambiguous justice*, when cases rely on *ambiguous science*.

With respect to Findley’s doubts regarding jurors and judges, laypersons are expected to make decisions on “complex and unresolved issues” in everyday life.²²⁵ Medical cases are an excellent example. When one is diagnosed with a serious disease, an acceptable response is going to another doctor (with a better reputation) and weighing the reliability of the two diagnoses.²²⁶ Though confusing, patients carefully consider the medical information given to them. A second diagnosis, whether the same or different from the first one, is always meaningful. Similarly, this article’s proposal for more expert testimony helps enhance the juror’s understanding of the underlying issues.

V. CONCLUSION

To be sure, strictly enforcing and applying *Daubert* standard to forensic evidence would be a simple and desirable solution. However, while the unreliability of forensic evidence is becoming increasingly well known, the courts are still reluctant to apply a strict admissibility standard, particularly against government forensic evidence. Even the NRC’s groundbreaking report has not changed the courts’ practices. This article finds that without strict review from the courts, the forensics community will not embrace genuine scientific standards. Moreover, practically and informally, the

Consumer Protection, 99 CAL. L. REV. 1117, 1138 (2011) (“[T]oday, 95 percent of criminal convictions result from guilty pleas and only 5 percent result from trials.”).

223. Michael McConville & Chester L. Mirsky, *Criminal Defense of the Poor in New York City*, 15 N.Y.U. REV. L. & SOC. CHANGE 581, 764 (1986–1987). The exact number of percentage might differ, because this study was conducted more than 30 years ago.

224. Tuerkheimer, *supra* note 219.

225. Findley et al., *supra* note 169, at 305.

226. See Kristine Crane, *A Patient’s Guide to Second Opinions*, U.S. NEWS (Jul. 23, 2014), <http://health.usnews.com/health-news/patient-advice/articles/2014/07/23/a-patients-guide-to-second-opinions> (“Second opinions are fairly routine. . . . ‘Any doctor who is any good at what they do will welcome a second opinion, because it will usually be a confirming opinion.’” (quoting Trisha Torrey)); Becky Ham, *Seeking a Second... or Third... Opinion*, CENTER FOR ADVANCING HEARTH, <http://www.cfah.org/prepared-patient/prepared-patient-articles/seeking-a-secondor-thirdopinion> (last visited Mar. 1, 2017) (“Seeking out multiple sources of expert advice is one of the best ways to gather this information before proceeding with a treatment plan.”).

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prosecution enjoys a lower threshold than the defense. To resolve these problems, this article argues an asymmetry admissibility standard that is relaxed for defense. This asymmetric standard first levels the playing field, because the current admissibility standard favors the state. In addition, counter-intuitively, this new standard would ultimately help strengthen the government's forensic evidence, which make this proposal more acceptable. This article also presents legal grounds to support the asymmetrical standard and provides specific examples of how the standard would be applied. Considering the continued resistance before and after the 2009 NRC report, this proposal would be a practical method to strengthen forensic evidence.